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# THE SURGICAL CLINICS OF NORTH AMERICA

Volume 6

Number 4

## CLINIC OF DR ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

### SURGERY OF THE STOMACH

*I shall present to you this morning two interesting stomach cases which we have had under observation for some time. We shall operate upon these cases and later shall show you several other stomach cases which we operated upon within the last two weeks so as to give you a fairly broad conception of modern stomach surgery.*

This patient is one referred to me by Dr Don Abbott, of the Presbyterian Hospital, Mr A D, aged fifty seven, a railroad man, who gives the following history

For the greater part of his life he has been in excellent health with the exception of the fact that he has been troubled more or less with constipation, especially during the last ten years. For the last three months he has been complaining of abdominal pain. This pain has been diffuse over the abdomen. He has had it almost daily for the last three months. He describes it as a rolling, crackling, gripping sensation associated with belching, and states that this belching gives relief. He has no distress before breakfast. After breakfast the distress comes on within a half hour to an hour. He has kept on with his work until the last few days. He has slept pretty well and has little pain at night. He has no vomiting, no nausea but a good deal of flatulence. He has lost 18 pounds in the last three months.

Examination shows a man who has evidently lost some weight and strength. On inspecting the abdomen in a good light there

is to be found a very marked enlargement of the stomach with marked peristalsis. There is a very marked retention of a quart or more of fluid. Examination of the stomach contents shows no free hydrochloric acid, large amount of lactic acid, and no bacilli. Examination of the stool shows occult blood. The x-ray picture shows a huge stomach without a well defined cap and marked obstruction at the pylorus. Physical examination fails to reveal a palpable tumor in the pyloric region.

Dr Abbott and I have discussed the case very fully and have thought that the most probable diagnosis was that of a small circular carcinoma at the pylorus producing an almost complete obstruction and with the associated picture of an absence of free hydrochloric acid with occult blood in the stool. There is to be sure the possibility that this obstruction may be due to scar from an ulcer which has not completely healed and still gives the presence of some occult blood with a rather atypical ulcer history.

The patient has been prepared for operation and we shall do the operation if possible under ethylene. He has been given  $\frac{1}{2}$  grain of morphin hypodermically. After he gets fairly well under the ethylene I shall inject the abdominal wall with  $\frac{1}{2}$  of 1 per cent novocain solution. As I open the peritoneal cavity and bring the stomach into view, you see at once that this is a huge stomach, not only large but with thickened hypertrophic musculature. As I bring the pylorus into view you see that there is an adhesion to the anterior surface of the stomach near the pylorus of the great omentum. I separate this adhesion and find a dimple under this adhesion pointing to the site of an ulcer that has almost perforated and which evidently did not perforate into the general peritoneal cavity on account of the protection formed by the adherent omentum. As I pick up the pylorus I find a dense, thickened mass, about an inch in length which seems to surround the greater part of the circumference of the stomach close up to the pylorus. Examination of the lesser and greater curvatures shows no enlarged glands. I pick up one gland about the size of a bean which however, may be normal, and I remove this for the purpose of microscopic examina-

tion. I find no evidence of metastases in the liver or implantation of carcinoma on the peritoneum. From the gross appearance of the lesion I am inclined to believe that it is a massive indurated ulcer and not a carcinoma. Dr. Abbott and I, however, feel that there is very definite possibility of carcinoma, and we shall, therefore, proceed to make a resection. The resection is comparatively simple because the structures are so movable. I first

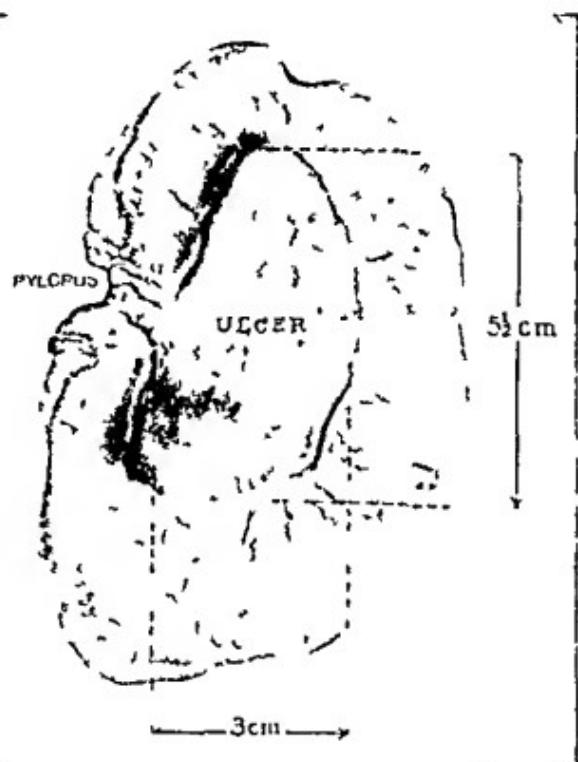


Fig. 266

separate the transverse colon from the greater curvature of the stomach and from the under surface of the duodenum, doubly ligating the vessels close to the stomach and colon. In the same way I now separate the gastrohepatic omentum from the duodenum. I shall remove about a third of the stomach, packing the viscera well off from the general peritoneal cavity and applying two large clamps and divide between them. I then close the stomach end with three rows of Pagenstecher linen suture. I

divide the duodenum just below the pylorus and close the duodenal end with three rows of suture of Pagenstecher linen and a third suture of fine catgut. I now pick up a piece of the jejunum about 12 inches from the beginning of the jejunum and make an anterior gastro enterostomy. I close the abdominal wall without any drainage.

Let us now examine this gross section. On opening it freely so as to expose the mucosa of both stomach and duodenum we find a large indurated ulcer (Fig. 266) about  $1\frac{1}{2}$  inches in diameter on the stomach side of the pylorus. To gross appearances this is an indurated ulcer. It will be necessary however to make very careful microscopic examination in order to determine whether or not it is a carcinoma or any part of the ulcer has become carcinomatous. The prognosis is fairly good in this case and if it is not a carcinoma he should go on to a very satisfactory permanent cure.<sup>1</sup>

The case is a very instructive one from the standpoint of the difficulty of determining in the face of such a confusing picture before operation the differential diagnosis between ulcer and carcinoma.

The second patient Mr H, aged fifty six was referred to me by one of my colleagues in San Francisco. He was seen by Dr Eloesser of San Francisco some weeks ago complaining of some abdominal distress. He states that he had had this off and on for the past six months, but particularly during the last three months a feeling of discomfort in the epigastrium and a sense of fulness. This would come on about fifteen or twenty minutes after eating and last about one half hour. Soda seemed to give relief. He never vomited and rarely belched. About four weeks ago for the first time he went to a doctor, and since that time has been on a diet consisting for the most part of liquid foods and since then has not had very much distress. Dr Eloesser obtained some very good x ray plates of the stomach and these showed a very marked deformity of the stomach.

<sup>1</sup> Microscopic examination of the tissue taken from several portions of the ulcer failed to show any carcinoma.

close to the pylorus, the lower third of the stomach being very much contracted and resembling somewhat in appearance the condition of "leather-bottle stomach." Dr. Eloesser had a Wassermann test made, which proved to be negative, but on account of the singular deformity he thought it was wise before advising an exploratory to give the patient several injections of salvarsan to see if there would be any improvement in the case.

Physical examination of the upper abdomen showed a distinct mass in the region of the pylorus extending from the pylorus several inches to the left. On the liquid diet and after the salvarsan injections were used the patient improved a good deal and gained 8 or 9 pounds in weight. He was very hopeful about himself and hesitated to have any exploratory made on account of the marked improvement that had followed the treatment.

When he came to the Presbyterian Hospital he was seen by Dr Bassoe, our neurologist, who went over the case carefully to see if there were any evidences of a specific lesion. He failed to find any evidence of syphilis. Dr E E Irons was called in consultation, and on going over the case felt that it was probably a carcinoma and that an exploratory should be made, and if the conditions found warranted, a resection undertaken. The patient's general condition was very good. Hemoglobin was 90 per cent., red cells 5,000,000. Urinalysis was normal. Occult blood was found in the stool.

I feel that we should make an exploration here, and we shall do as we did in the previous case, attempt to carry this out under ethylene preceded by morphin and made more effective by cocainizing the abdominal wall. As I open the peritoneal cavity I come down to a definite mass which can be palpated through the abdominal wall. I find that this is a large carcinoma of the stomach extending from the pylorus for a distance of 5 or 6 inches on the anterior surface and for a greater distance on the posterior wall of the stomach. The lesser curvature is involved almost up to the esophagus. There are some small peritoneal implantations. The lymphatics are not extensively involved. There is no evidence of metastases in the liver. I find that it would be difficult or impossible to do a gastro-enterostomy that

would function well I find that it would be impossible to do a resection which would be in any sense a radical removal of all the gross carcinoma I shall therefore make this operation purely exploratory and close the abdominal wall in the usual way without any drainage

The picture of the gross pathologic anatomy is so definite that there can be in this case no question but we have an extensive and diffuse carcinoma involving more than one-half of the stomach wall It is not the typical picture of a 'leather bottle stomach' due to carcinoma but that part of the stomach close to the pylorus and extending from the pylorus for a distance of 4 or 5 inches resembles very much indeed the typical 'leather bottle stomach' of a *linitis plastica*

I am very sorry that we are not able to do a resection in this case and that even a gastro enterostomy is out of the question but from long experience with similar cases I am satisfied that the wisest thing to do is simply an exploratory

I fortunately have in the hospital several other cases which I shall show which we have operated upon recently The first of these is a very unusual case This patient was operated on by my former colleague Dr Dean Lewis five years ago—a gastric ulcer in which a resection of the ulcer was made At operation a peptic ulcer was found on the posterior wall close to the lesser curvature The ulcer was resected and the stomach wound closed by catgut sutures The patient made a very good recovery but later returned with symptoms of ulcer distress She returned to the hospital off and on a number of times and finally after Dr Lewis went down to Baltimore she came to my service After studying the case carefully we found a definite defect in the x ray on the lesser curvature which seemed to be quite deep In view of her previous experience and the fact that she was suffering rather markedly from ulcer distress I determined to do a radical operation and make a second Billroth resection of the stomach I did this through a midline incision between the ensiform and the umbilicus and found a very dense calloused penetrating ulcer of the lesser curvature which involved for a distance of an inch and a half the gastrohepatic omentum The ulcer

seemed to perforate into the gastrohepatic omentum. This was very much thickened and indurated, and it was necessary to make a very extensive dissection which I thought I did with a great deal of care to remove not only the stomach, but the portion of the gastrohepatic omentum which was involved in the inflammatory process (Figs 267, 268). The ulcer was also firmly adherent to the pancreas. The patient after operation seemed to make a very good operative recovery for the first few days

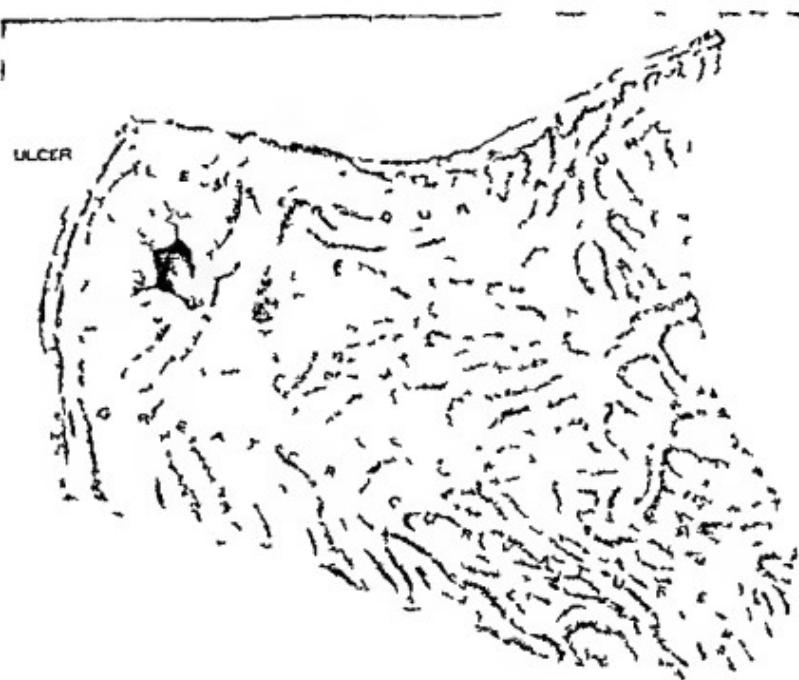


Fig. 267

At the end of four or five days she became slightly jaundiced, and this jaundice gradually deepened. I was greatly distressed with this, and after watching the patient for about two weeks I found that not only had the jaundice increased, but there was a definitely dilated gall bladder, showing, to my mind, an obstruction of the common duct. Whether this obstruction to the common duct was due to operative injury of the common duct during the resection or whether it was due to edema of the

pancreas obstructing the common duct, as in chronic interstitial pancreatitis, was a question in my mind.

At the end of about two weeks, however, I determined to make an exploratory laparotomy. I found the gall-bladder

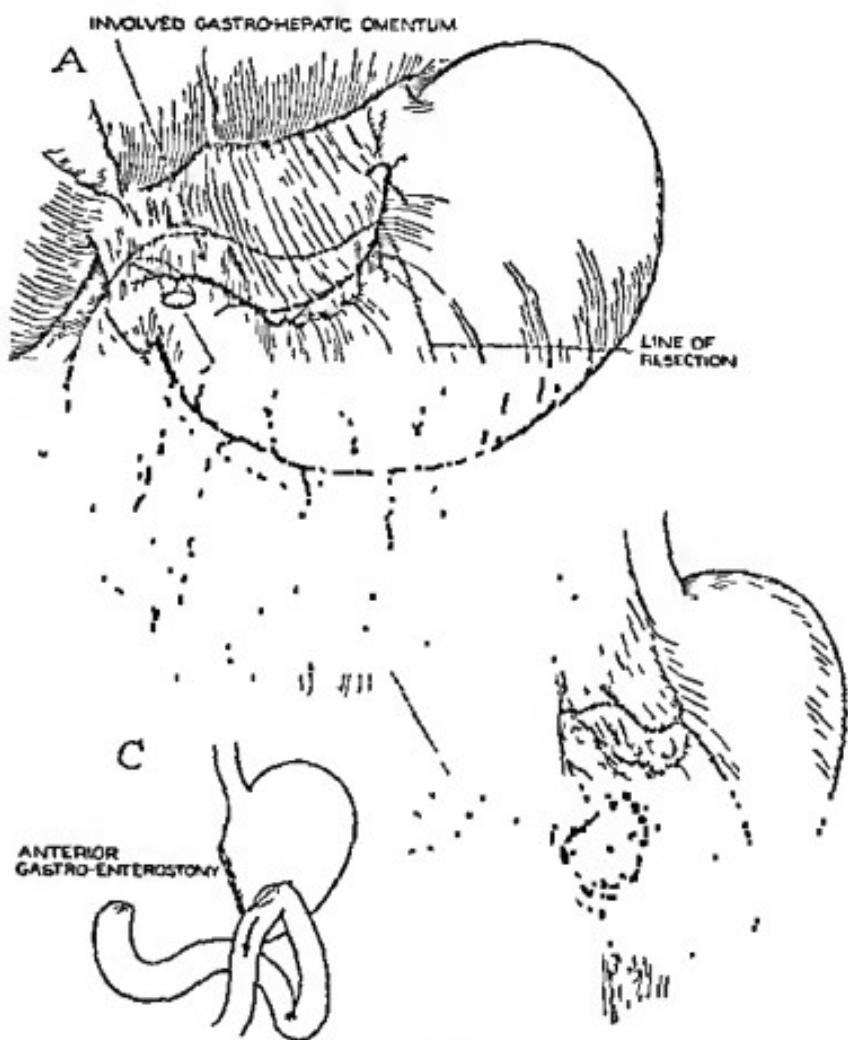


Fig. 263

greatly dilated and made an anastomosis between the jejunum, about 6 or 8 inches from the point at which I had attached it to the stomach in the gastro enterostomy, making a cholecto-stenostomy. Fortunately, the patient went on to a good recovery.

The bile drained freely into the bowel and the jaundice as you see, disappeared. The patient is picking up weight and strength and will I think go on to a permanent recovery from a serious pathologic condition due to ulcer and to the serious matter of an obstruction of the common duct.

In going over the literature of cases of this kind I find that a number of surgeons have had similar experiences so many of them in fact that Haberer, who has done over one thousand resections for ulcer laid down the rule that in these penetrating ulcers of the lesser curvature close to the common duct resection should not be made on account of the possibility of obstructing the common duct and that the surgeon in these cases should content himself with a gastro enterostomy. The case has certainly been a very instructive one to me and to my associates on the service.

The next case is this lady, Mrs G R, who was operated on several weeks ago. She is a patient of Dr Ralph Brown sixty two years of age and came into the hospital with abdominal distress lasting for about four months. She had lost 10 pounds in weight. The other symptoms were loss of appetite, very marked retention due to an obstruction at the pylorus, and marked constipation. After studying the case carefully Dr Brown made a clinical diagnosis of ulcer. X Ray films showed a defect and narrowing of the pyloric region with rather marked obstruction. The patient is rather pale. She has about 80 per cent hemoglobin, however. Urine was normal and there was blood in the stool, a large amount of chemical blood being found in a large number of stools for several weeks. After studying the case for a considerable period Dr Brown felt it was wise to have an exploratory made. At the time of the operation I did a second Billroth and resected about 3 inches of the stomach. I found a marked pyloric obstruction due to an old ulcer and a definite defect on the lesser curvature about 2 inches from the pylorus. This defect is  $\frac{1}{2}$  inch in diameter. We therefore had to deal with two ulcers of the stomach, one at the pylorus producing marked obstruction and one on the lesser curvature (Fig 269).

The patient went on to an unusually satisfactory recovery and has been gaining in weight and strength since the operation



Fig 269

I present her to you as an interesting example of multiple ulcer one in which I would advise today a resection rather than a gastro-enterostomy

The next patient is one whom I operated on three days ago another patient of Dr Ralph Brown a minister forty seven years of age who has had during the last eight or ten years a half dozen serious hemorrhages from the stomach and duodenum Some of these hemorrhages have been very severe so that the patient was almost at the point of death from loss of blood There are several very singular facts in regard to this case which must be noted One is that he makes no complaint whatever of having anything like a typical ulcer history These hemorrhages come on when the patient is apparently in good condition Another fact is that very careful fluoroscopic examination and x ray plates have failed to show any marked ulcer evidence though Dr Rose who is in charge of our laboratory felt that there was a slight defect very close to the pylorus in the duo

denum, although this was a matter open to question. The patient has been seen by some very good men, Dr Frank Billings, Dr B W Sippy, and Dr R C Brown, who have in the course of the last ten years studied the case with a good deal of care.

When I went over the case with Dr Brown last week he felt that it was a very atypical case. It was very unusual to have a history of ten gastric hemorrhages without more definite x-ray evidence of the existence of an ulcer and without more of a clinical picture of ulcer both of which seemed to be absent in this case. Another interesting fact was that Dr Abbott, who has had charge of a brother of this patient reports that he also has had three stomach hemorrhages rather severe in character, and some evidence of hemophilia. In this patient of ours the coagulation time was normal—about three and a half minutes, and we failed to find anything unusual in the blood picture, I felt very strongly that because this patient had had eight or ten hemorrhages an exploratory operation should be made. I rather felt that we would find some definite organic explanation for these hemorrhages. I was rather prepared to find an ulcer on the posterior surface and near the pylorus which might account for the bleeding but which might not be visible in the x-ray examination. At the exploratory, therefore I made a most careful examination of the stomach, duodenum and pylorus. The stomach showed no change and seemed to be quite normal. I could find no induration anywhere in the stomach, either on the lesser curvature, the posterior surface or the greater curvature or the cardiac end of the stomach. I could find no induration in the duodenum and no evidence of ulcer which involved all the coats of the stomach. The gall bladder seemed normal, the liver seemed normal, the spleen was rather small, but apparently normal. There was an adhesion of the great omentum leading down to the right inguinal region probably adherent to the cecum or appendix. I tried to bring the appendix into view, but could not do so and because of the absence of any evidence of appendicitis I did not want to do any damage to the patient by making an additional appendectomy.

incision which would have been required to expose that region on account of the adhesions I therefore made the operation purely exploratory and I desire to explain to you what I believe to be the facts in this case

I believe that this patient has had his repeated severe hemorrhages from erosions of the stomach that these erosions have been superficial and have left no scars in the musculature or in the peritoneal coats of the stomach or any thickening which could be found by palpation These erosions therefore to my mind are simply the first stage of a peptic ulcer in other words I think they are superficial peptic ulcers due to the same pathology namely lesions of the blood vessels in the mucosa which have so lowered the resistance of the tissue that it becomes digested with the gastric juice containing free hydrochloric acid and pepsin I am rather inclined to believe that in cases of this kind these erosions are multiple and that if we could make a wide inspection of the inside of the stomach during one of these attacks that we would find a hemorrhage coming from a number of points

I am not sorry that we have in this case made an exploration I felt that we can exclude from this picture a carcinoma and ulcer that would be likely to produce perforation or deep penetration which would require operative interference and that this patient should be placed upon a good common sense management and that in the event of another hemorrhage he should be put at once under morphin and an effort made by management to reduce the occurrence of these hemorrhages to the minimum

This case gives me the opportunity of presenting to you this thought that we must realize from our present day knowledge that we may have such a condition as peptic ulcer disease with all the evidence of peptic ulcer without there being a gross peptic ulcer which is demonstrable at the time of operation It is not difficult to conceive of this condition due to the same essential causes as are typical easily recognizable peptic ulcers but so superficial in character that they lack even on very careful examination the gross pathologic anatomy of the typical peptic ulcer

To those of you who read German I would recommend reading the recent admirable article on peptic ulcer by Hauser, published in the fourth volume of the Henke-Lubarsch System on special pathologic anatomy and histology. I warn you, however, that this is a very exhaustive article of about 450 pages, which I have found gives one a most complete picture of the pathology of peptic ulcer disease.



## CARCINOMA OF THE ASCENDING COLON

I WANT to operate upon a patient this morning in whom a clinical diagnosis of carcinoma of the ascending colon has been made. This man is fifty-seven years of age, has always been in good health until the last three or four months. During this period he has complained of some distress in the abdomen, especially on the right side. He has no evidence of obstruction or even partial obstruction, but he describes the distress as being that due to slight colicky attacks of pain. He has lost some strength, not very much weight, and he has noticed in his stools some blood. He was examined several years before this by Dr. B. W. Sippy, who made a diagnosis of colitis, and he was placed on bowel management for that condition and apparently improved, so that he had no further trouble. This time he consulted Dr. A. F. Sippy, who was rather inclined from the clinical picture alone to make a diagnosis of carcinoma. However, from the fluoroscopic examination of the colon as the colon filled from the rectum up there was a definite filling defect as the barium solution came into the ascending colon, a filling defect which seemed to be several inches above the cecum. It was a question in Dr. Sippy's mind whether or not he could palpate a tumor at that point. The patient was slightly tender, not very much so, but it was difficult to palpate any definite tumor. Later repeated examinations showed a very considerable amount of blood in the feces, and with these pieces of evidence the diagnosis seemed to be fairly definite.

This morning the patient is prepared for operation and we shall attempt to do the operation under ethylene preceded by a small dose of morphin and aided by infiltrating the abdominal wall with novocain and adrenalin. I begin my incision a little higher than the usual muscle-splitting incision for an appendicitis, possibly 2 inches higher, and make a much longer incision than is usually made for appendectomy. Otherwise the incision

is essentially the same dividing the external oblique parallel with its fibers and parallel with the skin incision. You see the incision is about 8 inches in length. I now separate the internal oblique and transversalis parallel with their fibers and carry the division of these muscles well up over the rectus muscle making it possible to make a very large opening in the abdomen holding the edges of the wound apart with four retractors in the hands of two assistants. As I open the peritoneal cavity and bring up the cecum and appendix they seem quite normal. The ileum seems quite normal. I therefore examine the ascending colon at a point 3 or 4 inches above the cecum and find a definite indurated mass in the posterior wall of the ascending colon. It feels about as large in diameter as a silver dollar. As I examine it carefully I can push the anterior wall down into the crater which is to be felt quite distinctly and which to my mind makes the clinical diagnosis of carcinoma almost absolute. There seems to be no palpable glandular involvement no metastases in the liver and no implantations on the peritoneum. The case seems like a favorable one for resection. As I study the problem it seems to me best to remove the cecum and appendix with about an inch or more of the ileum and the entire ascending colon and mesentery tributary to this segment of bowel. In order to accomplish this it is necessary for me to divide the outer layer of the mesocecum which is avascular and I do this the entire length of the intestinal segment from below the appendix up to the hepatic flexure. This enables me to mobilize this segment of bowel. As I palpate with great care the mesentery of the ascending colon I find several palpable glands so that I shall remove not only the bowel but a wide segment of the mesentery containing these glands. I first of all ligate pretty well internal to these palpable glands the vessels of the mesentery. I then divide the ileum about 2 inches from the ileocecal valve and close the end with three rows of suture. I next divide the ascending colon almost up to the point of the hepatic flexure and close this end in the same way with three rows of suture using Pagenstecher linen which I think should be practically always used in intestinal work whether it is applicable or not in gastric surgery.

because of the objection that it is possibly a factor in the production of such lesions as jejunal ulcer in gastro-enterostomy. No such objection holds good in using it as a material for suturing the intestine, either the large or small intestine. There is a little bleeding in the mesentery close to the stump of the ileum, and it is necessary for me to control this by two or three compression sutures of fine catgut. I find that it would be difficult for me to make an end to end anastomosis if I desired to do so. As a matter of fact, however, I prefer very much in work of this particular type a side to side anastomosis as being very much safer. I shall, therefore, make an anastomosis between the ileum and the first part of the transverse colon well beyond the hepatic flexure. You see I do this very much in the same way as we make a gastro enterostomy, putting a pair of intestinal clamps on the first part of the transverse colon and one on the ileum, bringing the two intestinal clamps together and making an anastomosis with three rows of sutures. Technically, I am not entirely satisfied with the anastomosis which I have made because there is a short loop of the ileum distal to my anastomosis and in the same way there is a short loop of the transverse colon. I do not believe, however, that these are apt to give any serious trouble in this case. The contents of the ileum being fluid, it empties itself very freely into the large bowel, and the segment of the colon extending from the anastomosis to the hepatic flexure is so short in this case that I do not believe it will be wise to remove it. The wound is now closed just as we close the ordinary muscle splitting incision for appendectomy. I shall, however, put a short tube just entering the peritoneum, a split rubber tube about the size of my little finger containing a small iodoform wick. The patient is in very good condition at the close of the operation.

I now open the specimen and shall examine it carefully and present it to you for your inspection. You see that we have removed a block of the large and small intestines, probably about 10 inches in length (Fig 270). In almost the center of this is a papillary carcinoma about the size of a silver dollar. Although this is a papillary mass projecting above the surface at the same

time that we examine it with the palpating finger, we find it is surrounded by an indurated circumference which gave to my palpating finger on examining the bowel before removal the sense of a crater like ulcer at this point. This will be examined, of course, microscopically for our records, and yet the gross appearance of this lesion is so typical that there can be no question as to its pathology. As I examine the mesentery in close contact to the ascending colon I pick up at this point a gland a little larger than a pin which looks normal. As I split it open I see no definite evidence of carcinoma. It may or may not contain

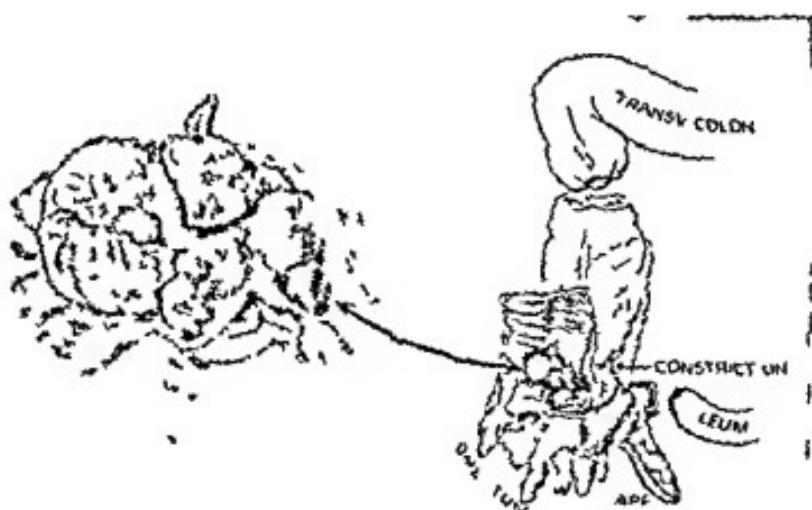


Fig. 270

carcinoma cells. It is quite possible that it is simply inflammatory and has not been involved in the carcinomatous process. There are some rules which I want to discuss with you for your instruction in regard to the after management of a case of this kind. Fluids are very necessary to the patient after such an operation. I would not give large amounts of fluid by rectum, but I think without much risk we can give 6 ounces of normal salt solution every three hours let us say, unless it gives some feeling of colic or distension. I would not want to give him fluids by mouth for the first twelve to twenty four hours. As soon, however as we find he will tolerate fluids well we will

give him small amounts of water, gradually increasing this. If he cannot take fluids by rectum or by stomach for two or three days after operation, I shall give him normal salt solution under the breast, so that he would have 1500 to 2000 c.c. of salt solution in each twenty four hours. I shall give him a small amount of morphin, as little as he can get on with, and then watch the development. If he goes on to a good recovery the course of events will probably be that within forty eight hours he will be getting sufficient fluid by mouth that he will expel gas with a low enema or rectal tube and within another forty eight hours will be taking a fair amount of liquid nourishment. If, on the other hand, he has serious trouble in the way of distention, I would seriously consider picking up the ileum, which can be done very readily distal to the anastomosis and sewing in the distal end a fair sized rubber tube let us say  $\frac{1}{4}$  inch in diameter, for the purpose of acting as a safety valve for the escape of gas and fecal contents. I think that this may be necessary in possibly 1 out of 4 or 5 of these cases. We might have taken the necessary steps to put a tube in the ileum before we made the closure in this case. I certainly would have done that if there had been any evidence of obstructive symptoms but in this particular case in the absence of any evidence whatever of obstructive symptoms I feel that we are quite warranted in omitting the enterostomy. I shall not hesitate at all however, at the end of forty eight or sixty hours if there is marked tympany and he cannot obtain expulsion of gas by the simpler methods of enema and rectal tube, to send the patient back to the operating room and under a few whiffs of ethylene open up the central portion of the incision and place a tube in the distal end of the ileum.

What is the prognosis in this case first from an operative standpoint? I think probably this man's chances are about four to one of recovery from operation. What are his chances as far as a permanent cure is concerned? I think probably one chance out of four of permanent cure in the sense that he will live three or five years or more without any recurrence. Carcinoma of the large intestine lends itself to radical operation for

permanent cure better than carcinoma in many other locations in the body. It is by no means a hopeless proposition. Where it is early recognized and radical operation done the prospects are fairly favorable. I have several other patients on the service which represent this same problem and the cases which I shall show you today give you a broader conception of this whole situation.

This next man is one who came onto the service three months ago an extreme picture of obstruction. He was blown up like a balloon. I had an x ray picture taken at once which showed a perfectly enormous colon and intestines 4 or 5 inches in diameter. These showed very beautifully in a simple x ray without barium because of the great distention of these coils with gas. The barium injection showed an obstruction in the sigmoid. He was sent right to the operating room and under local anesthesia a colostomy was made using the large bowel about the junction of the sigmoid with the descending colon. Into this segment of large bowel I introduced a large rubber tube about as large as my index finger held in position with two purse-string sutures of Pagenstecher linen so as to make an air tight and water tight joint. I then covered the bowel with thick oint of zinc paste put on a copious dressing and removing the clamp which we had over the tube allowed the gas and fecal matter to escape at once so as to relieve the enormous distension. The patient very promptly went on to a good recovery. The distention disappeared. We x rayed him again and found a distinct lesion about the center of the sigmoid which seemed to form an almost complete obstruction at that point. Several weeks later I made another operation opening the patient up in the midline. I made an exploration of the abdominal contents and finding no metastases in the liver and not very much glandular involvement about the carcinoma I decided to make a radical operation. I did this by the plan of Mikulicz bringing out the entire sigmoid with the tumor and with the colostomy opening and then removing the loop containing the tumor and the colostomy opening I sewed the two segments of bowel together like the barrels of a double barrel shotgun and stitched them into the muscle-splitting incision which I had used for the colostomy.

The patient went on to recovery, but after some hardships. He had a slight pneumonia and had some infection about the wound. Later I clamped the spur between these two limbs of the bowel, cutting it back for a distance of 3 inches with a Mikulicz clamp and we are now allowing what has become a fecal fistula to close gradually. The fecal current is taking its normal route and is being expelled almost entirely through the rectum, although there is a little leakage through the fistulous tract. The man is improving in general health and strength and I hope will be greatly benefited by the operative procedures which have been employed, although there is this discouraging feature in the case, that there was a very definite glandular involvement in the glands removed in the mesosigmoid at the time of the Mikulicz operation.

I have a third patient whom I shall present to you now, a patient who was brought to the hospital with marked obstructive symptoms and with no palpable tumor in the rectum. The barium picture, however, obtained by throwing barium solution into the lower bowel showed, apparently an absolute obstruction at the rectosigmoid. I at once made a colostomy under local, using the sigmoid loop, and making the incision a muscle-splitting one on the left side. Examination at the time of the operation showed the involvement of the liver, not very much glandular involvement in the immediate neighborhood of the primary lesion, and the question which we must answer now is as to whether we shall attempt to remove the primary growth or be satisfied with the palliation that can be obtained with an artificial anus. From my experience with these cases I am rather inclined to believe that the best prospects for the patient will be to be satisfied with the colostomy opening.



CLINIC OF DRs ALLEN B KANAVEL  
AND SUMNER L KOCH

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PREOPERATIVE AND POSTOPERATIVE CARE OF  
PATIENTS<sup>1</sup>

THE preoperative and postoperative care of patients is of much greater importance than is commonly believed by interns. We have magnified the part that the technical procedure plays in the cure of the patient, forgetting that the preservation and the proper stimulation of the physiologic functions are the basic factors upon which any technical procedure must depend for its success. With this in mind it is our purpose to emphasize the essential factors in the pre and postoperative care of the patients under your charge. Upon you devolves a great responsibility, you must be able not alone to meet emergencies but to care for the patients in an understanding and sympathetic manner, to stimulate and increase their physiologic processes, and to guide them intelligently through the critical days following operation.

General Suggestions.—Patients should be seen as promptly as possible after they are admitted to the hospital. They should be assured that the necessary examinations will be started promptly. Orders for a blood count for a urine examination, and diet should be left for them immediately. Not uncommonly patients are nervous and apprehensive on entering the hospital. Prompt attention and kindly assurance from some one on the service will help a great deal toward putting them at ease and making their first days in the hospital less irksome.

Preoperative orders should be left as early in the day as possible so as not to delay the work of the nurses and orderlies.

<sup>1</sup> From the Surgical Department of the Northwestern University Medical School. A lecture to the interns at Wesley Memorial Hospital.

Orders for patients should be *written* and should be as explicit as possible. Frequently a word of explanation to the nurses as to the nature of the case will enlist more intelligent and helpful co-operation than a page of orders. Failure to get results is usually due to a misunderstanding of what was expected from a nurse or assistant.

*If a new patient is admitted, if some unforeseen complication arises, if a patient dies* the attending surgeon or the second on the service should be notified at once.

**Preliminary Examination.**—This includes the history, physical examination, blood-count, and urine examination. The coagulation time of the blood should be determined in every case at the time that the blood-count is made.

Every brain case, every case of jaundice, of spine, spinal cord, or prostatic disease should have his blood typed before operation, and if suitable donors are present among the friends or relatives their blood should be typed also.

Every kidney and prostate case and every patient seriously ill should have a functional kidney test. In cases with evident impairment of renal function an NPN and creatinin test should be carried out.

Patients with jaundice should receive 100 grains of calcium lactate daily for six or seven days before operation, and 5 c.c. of 10 per cent. calcium chlorid in sterile water intravenously daily for two days before operation, and on the day following operation.

**Preparation for Operation.**—As a general routine the patient should have an enema the evening before operation, no breakfast, morphin sulphate (gr.  $\frac{1}{2}$  to  $\frac{1}{4}$ ) with atropin sulphate (gr.  $\frac{1}{16}$  to  $\frac{1}{32}$ ) forty-five minutes before operation. For cases to be done under local anesthesia morphin sulphate (gr.  $\frac{1}{2}$ ) and scopolamin (gr.  $\frac{1}{16}$  to  $\frac{1}{32}$ ) should be given forty-five minutes before operation. If there is a question as to whether operation can be done under local anesthesia, it is wiser to omit the scopolamin, for frequently after an injection of scopolamin patients take ether poorly.

With *head cases*, if a man, the head should be shaved com-

pletely; if the patient is a woman, a sufficient area should be shaved to ensure ample room for operation.

In patients with *intestinal obstruction* the administration of Ringer's solution intravenously should be started as soon as possible.

With *stomach cases* or preceding *gastro-enterostomy* or operation for intestinal obstruction the stomach should be washed out on the morning of the operation. Failure to do so may result in contamination of the operative field when the stomach is opened.

With *hand cases* the hand should be soaked in warm soapy water for twenty minutes on the day preceding operation and for twenty minutes on the morning of operation, and the nails should be carefully cleaned and trimmed. The hand and forearm should be shaved, and every effort made to have the hand as clean and free from thick calloused skin as possible. The same effort to have the field of operation in the best possible condition applies with still greater force to *bone cases*.

For *radium application to the cervix* the perineum should be prepared as for perineal operations.

Before *cystostomy* or *prostatectomy* the bladder should be irrigated and distended with sterile water; the catheter, which is clamped off, should be left in place. The table should be such that the head can be lowered as in Trendelenburg's position.

In operating on *infants* (spina bifida, cleft-palate, etc.) the patient should be bandaged in cotton wool as completely as possible before coming to the operating room.

The first assistant should be sure that the proper instruments, apparatus, lights, etc., are ready and in working order, that the patient has been properly prepared, that a special nurse, if desired, has been arranged for, and that postoperative orders have been left *before operation* for the nurse in charge of the case.

Patients who require scrubbing before operation—hemorrhoid cases, vaginal cases, etc.—should reach the operating room ten minutes before the time set for operation so that administration of the anesthetic will not be delayed by the necessary preparation.

The nurse in the operating room should understand exactly what is to be done and in what order for example whether vaginal work is to be done on pelvic cases and whether before laparotomy or not

In the Operating Room —The proper table should be ready a table on which the head can be elevated for thyroid cases, a table which may be arranged for a sitting position for empyema cases, gall bladder table for gall bladder, stomach and kidney cases shoulder pieces for pelvic cases so that the patient may be put in the Trendelenburg position, a table with stirrups for hemorrhoid cases, rectal cases, and cystoscopy

Sand bags should be ready for thyroid cases, kidney cases, etc A blood pressure apparatus should be ready for blood-pressure readings during all long and serious operations, and for constriction for hand cases Plaster material should be ready, if required for immobilization

If fat or extra skin is required for plastic work the appropriate portion of the body should be prepared before the patient comes into the operating room Before the anesthetic is given the first assistant should make sure that the field of operation is properly prepared for not infrequently those in charge of the preparation do not know exactly what is to be done and so fail to shave a sufficiently wide area

The anesthetist should make sure that all the paraphernalia he requires is on hand before the patient comes into the anesthetizing room a mask, gas machine with oxygen, full tanks, fresh ether tongue forceps air way towels, a strap for the patient's legs etc It is of especial importance that the mask of the gas apparatus should be cleansed with soap and water before every anesthetic If special apparatus is required—suction pump pharyngeal tubes etc—the anesthetist should be sure that they are ready *before the patient comes to the operating room*

General Postoperative Care —Three things are essential for prompt recovery after operation rest, fluids food None of them can be dispensed with for twenty four hours without definitely prolonging the postoperative course

To insure rest, morphin in  $\frac{1}{4}$ -or  $\frac{1}{6}$ -gr. doses, depending on the age and weight of the patient, is the most effective means at our command. Codein in  $\frac{1}{2}$ -gr. doses, or heroin in  $\frac{1}{12}$ -gr. doses (for an adult of 150 pounds) sometimes form an effective substitute. If the patient has an idiosyncrasy to opiates, hyoscine hydrobromid, gr.  $\frac{1}{12}$ , will usually be effective. Such drugs should be given hypodermically for twenty-four to forty-eight hours at such intervals as are necessary to maintain the patient's comfort. It is rarely necessary to give more than two doses in the first twenty-four hours and one in the second twenty-four hours. They should preferably be given late in the day so as to insure rest during the night. To permit a patient to reach the limit of his endurance the first or second night after operation and, finally, to give him a sedative at 1 or 2 A. M. makes a difficult situation for everyone concerned. Forethought and anticipation will help a great deal to make the postoperative course less trying both for the patient and the nurse.

After twenty-four or forty-eight hours 15 or 20 gr. of triple bromids for the adult patient of average weight, given at 7 P. M. for a few evenings, will help to keep the patient comfortable through the night. Veronal, sulphonal, or trional in 10- or 15-gr. doses, chloral 10 gr., luminal  $1\frac{1}{2}$  gr., or 2 allonal tablets may sometimes be used to advantage instead.

After a general anesthetic fluid can best be given for twenty-four or forty-eight hours by rectum, either continuously or as a high enema, a pint every two hours. The former method is usually more satisfactory. Tap-water is least irritating to the average patient. Glucose solution (5 per cent.) with sodium bicarbonate (3 per cent.) is sometimes tolerated and adds a definite food value to the fluid. If, for any reason, fluid cannot be given by rectum, it should be given subcutaneously until such a time as the patient can take it freely by mouth.

In an urgent case with a patient depleted by vomiting or hemorrhage, salt solution or 10 per cent. glucose solution may be given intravenously. It must be warm and given slowly to avoid placing too great a strain on an enfeebled heart. Glucose may be given at the rate of 1 gram per kilo of body weight, *i. e.*,

600 c.c. of 10 per cent solution for an individual of 132 pounds. If a suitable donor is available, transfusion of blood is by far the most desirable treatment and should be carried out without delay.

As soon as nausea has disappeared fluids may be given by mouth, in small quantities at first and warm rather than cold.

For twenty four or forty eight hours after a patient begins to take food liquid diet alone is least likely to upset the patient. After that time soft diet—custards, ice-cream, soft boiled eggs, toast, etc.—may be added, depending on the patient's appetite and his ability to tolerate food.

With patients who have been ill for some weeks or months, perhaps with an unrecognized empyema or an accumulation of pus within the abdomen, pelvis bones or soft tissues, the question of nutrition becomes of primary importance. Liquid diet of high caloric value—egg nog, chocolate malted milk, lemonade with lactose to the point of saturation, and thick broths—are particularly valuable immediately after operation and may be supplemented by the addition of eggs, custards, fruit and solid food as soon as the patient can tolerate them.

The *fluid intake and output* and the *caloric intake* should be carefully recorded during the critical days of the postoperative course. Unless this is done in every instance cases of renal insufficiency with resulting toxemia are certain to develop.

**Laparotomy**—For the average uncomplicated case in which the peritoneal cavity is opened, as for subacute or chronic appendicitis, hernia, ovarian cyst, fibromyoma of the uterus, pyosalpinx, etc., morphin may be given, as indicated in the preceding paragraphs for twenty four to forty eight hours.

Tap water should be given by rectum, continuously or a pint at two hour intervals until the patient can take fluids freely by mouth. If the patient has difficulty in retaining tap water at the end of twenty four hours it may be discontinued, but if he is still nauseated or vomiting, salt solution should be given subcutaneously in sufficient quantity to insure the daily administration of 3000 to 3 fluid f. individual of average weight.

Fluid by mouth should always be given in small quantities at the outset until one is certain that the patient can tolerate it without vomiting. Warm water or weak tea is tolerated best by the majority of patients. Not uncommonly the patient will express a desire for some particular type of drink—ginger ale, grape juice, orangeade, etc.—and, as a rule, the particular thing he craves will be least likely to cause nausea. When water, tea, and broth can be retained without difficulty, the administration of fluid may be pushed rather vigorously. Water in sufficient quantity is the most simple and effective stimulant of the excretory organs.

In the presence of persistent nausea, or of vomiting of small amounts of dark colored fluid at frequent intervals, gastric lavage is the surest means of obtaining relief. Repeated vomiting usually indicates a certain degree of dilatation of the stomach, sometimes brought about by the regurgitation of fluid from the small bowel. If the stomach is once completely emptied, vomiting is not likely to recur unless complications such as peritonitis are present.

The patient should not be allowed to go without urinating for more than eighteen or twenty hours after operation, *i. e.*, beyond the early morning of the day following operation, for if the bladder is once distended to the point of pain recovery of function is tedious and difficult. The only exception to this rule is in patients with spinal cord lesions. Difficulty in urination is a common occurrence after operation on the pelvic viscera, particularly after fixation of the uterus or operations requiring the presence of a pack in the cervix or vagina. It is important in such cases to make sure that the bladder is emptied before twenty-four hours have elapsed.

The earlier a patient is given cathartics, the more certain is he to suffer from gas pains and abdominal distress. The average patient may be given a mild cathartic, such as milk of magnesia, in three  $\frac{1}{2}$ -ounce doses at intervals of a half-hour, on the morning of the third day after operation. If he is comfortable and not distended, there is no objection to waiting until the fourth day. If the patient is distended or suffering from gas

pains twelve or twenty four hours after operation the passage of a rectal tube will frequently give relief. Large hot applications over the abdomen will help stimulate the passage of flatus and often give prompt and grateful relief from pain. Enemas are usually of no value until forty eight hours have elapsed and only serve to add to the patient's distress. Of the various drugs which are given for the purpose of stimulating contraction of the smooth muscle of the bowel and bladder pituitrin is the only one of recognized value. It should be used with caution. If indicated it should be given in 10 to 15 minim doses *intramuscularly*.

**Ruptured Appendix—Peritonitis**—In such cases the importance of rest fluids and food is increased in exact proportion to the seriousness of the patient's condition. With a patient who has been ill for some days it is important not to temporize for twelve or twenty four hours but to institute immediately measures that are certain to give results.

If a child for example has been suffering from peritonitis secondary to a ruptured appendix for four or five days has been vomiting repeatedly and is in a state of well developed acidosis fluid subcutaneously or glucose solution intravenously is of primary importance. The less the bowels are disturbed the easier will it be for the peritoneum to combat the infection present. In such cases tap water by rectum should always be given by the drop method and care should be taken not to cause over distention of the large bowel.

Gastric lavage should be resorted to promptly to get rid of irritating stomach contents and to keep the gastro-intestinal tract at rest. Retching and vomiting must have much the same effect on a peritoneum involved in a diffuse infection as active manipulation would have on an infected compound fracture. In the presence of extensive peritonitis it is wise to pass a Rehfuss tube and leave it in place so as to permit lavage and siphoning off of gastric contents at regular intervals.

If the infection can be limited to the lower abdomen or pelvis by placing the patient in an upright position the chances of recovery are undoubtedly improved. In Fowler's position the position of the trunk is practically vertical through the use of a

back-rest and knee-rest combined with elevation of the head of the bed.

In all cases of this type cathartics and enemas should be given with caution. Not uncommonly the patient has been purged to the point of dehydration before admission to the hospital. Following the operation the intestines are paralyzed from the effects of the mechanical trauma which has been superimposed on the inflammatory process already present. Frequently if the patient is left alone the bowels will move spontaneously on the third or fourth day. If they do not, a low enema may be given on the fourth or fifth day. The appearance of a fecal discharge in cases of gangrenous appendicitis has been noted to follow closely on the administration of a high enema. For the distention that not uncommonly occurs following operation in the presence of a peritonitis the passage of a rectal tube will sometimes serve. If this is ineffective the application of a big hot dressing over the entire abdomen or of an electric pad will usually relieve the distention and afford marked relief from pain.

The removal of drainage material in cases of peritonitis, whether generalized or localized, is a matter of great importance. Drainage material is placed in a wound with the idea of forming a pathway along which the infected secretion of the peritoneum can readily escape, of walling off an infected area, or stopping hemorrhage. In the latter condition drains may be removed in from twelve to twenty-four hours. The ideal result in an infected case is one in which drainage permits the escape of infected material so readily that no considerable quantity of it accumulates within the abdomen, and in which the drain is removed in such a way as not to leave an unobiterated pus cavity or a permanent sinus after its removal.

The surest way of securing such a result is to use smooth rubber-covered drains, to remove them very gradually, and always by twisting them rather than by pulling on them directly. Gauze drains rapidly become enmeshed with fibrinous exudate which may make their removal very difficult. Rubber-covered drains are less likely to become adherent to omentum or bowel.

At the end of forty eight hours drains should at least be twisted with artery forceps so as to free them from the fibrinous exudate surrounding them. Not infrequently a considerable quantity of infected material will escape from the wound after this is done. If the infection is mild or localized the drains may be removed at this time.

In streptococcal infections or with patients very ill it is wise to delay removal of drains until the fourth or fifth day, when one may begin gradually to remove the drains. The possibility of leaving an undrained area at the bottom of a wound by removing a considerable amount of drainage material at one time should not be forgotten. If gauze drainage has been left in the abdomen it is wise to give a few whiffs of nitrous oxide before attempting to remove it.

In cases of general peritonitis after all drainage material is removed it is not unusual for the wound to discharge foul smelling pus for a considerable period of time. The instillation of Dakin's fluid through a catheter, gently introduced into the depth of the wound will undoubtedly help to clear up the infection and shorten convalescence.

**Gastroenterostomy, Pylorectomy, Resection of Stomach, Operations on the Bowel**—After such operations the stomach should be kept absolutely at rest for forty eight or seventy two hours. Even small amounts of water may cause peristalsis and so exert tension on the suture line, with a resulting interference with healing and the possibility of hemorrhage.

If the patient begins to vomit or regurgitate small amounts of dark red fluid the stomach should be washed out immediately. Should vomiting continue a small stomach tube (Rehfuss tube) may be left in place and allowed to hang over the side of the bed. Through this the stomach may be washed until clear every two hours with tap water or a per cent sodium bicarbonate solution. During this period the patient should receive tap water by rectum supplemented by hypodermoclysis if necessary.

If postoperative hemorrhage should occur morphine to the point of tolerance should be given promptly. Gastric lavage with ice water may help by contracting the blood vessels, and

perhaps still more by keeping the stomach empty and allowing it to contract

At the end of forty eight hours water may be given in small amounts and increased rather rapidly At the end of seventy-two or ninety six hours the administration of food is begun according to Sippy's régime,  $\frac{1}{2}$  ounce each of milk and cream are given every hour and the amount increased as soon as the patient can tolerate more Ten or 15 grains each of sodium bicarbonate and magnesium oxid may be given fifteen minutes before each feeding to render the gastric secretion less acid and to serve as a mild laxative

In the average case ten days after operation the patient should be receiving six feedings daily, consisting of 4 ounces of milk and cream, soups, custards cereals, soft boiled eggs, baked potato, bacon, and small amounts of bread

Not infrequently cases of this character have been undergoing slow starvation for weeks because of long continued pyloric obstruction In such cases the question of fluid and diet after operation becomes of paramount importance

The care of patients after operations on the small or large bowel presents no essential features different from that after operations on the stomach After resection of a portion of the large bowel, after colostomy, or operations on the rectum tap water cannot be given and must be replaced by subcutaneous salt solution Fluid may usually be given freely by mouth after twenty four hours

In serious cases, intestinal obstruction with resection, etc., Crile advocates the use of morphin to the point of tolerance for seventy two or ninety six hours *i.e.*, giving  $\frac{1}{4}$  gr doses until the patient's respiration is lowered to 8 or 10 per minute, in order that intestinal movements may be completely suppressed There is no doubt that this method, combined with maintenance of fluid intake, is of live-saving value in serious cases

**Gall-bladder Cases**—Cases in which the gall bladder has been drained, or in which it has been removed and the abdomen closed, present the same indications for postoperative treatment as the ordinary laparotomy

If the common duct has been drained, or if it is necessary to leave drainage because of the removal of an infected gall bladder, or the presence of venous oozing the case is definitely more serious and requires particularly watchful postoperative care Postoperative pneumonia because of the tendency to keep the diaphragm immobilized and local peritonitis are the complications particularly to be watched for

Such patients should be encouraged to breathe as deeply as possible for at least fifteen minutes three times daily They should be turned from side to side several times during the twenty four hours As soon as possible they should be propped up in bed with a back rest

Drains should be removed slowly forty eight to ninety six hours after operation and with nitrous oxide anesthesia Should there be a tendency for the wound to close while there is still a considerable amount of drainage a strip of rubber tissue or a small rubber tube may be introduced into the wound to keep it open until the drainage has lessened Local peritonitis will evidence itself by the presence of an irregular temperature by nausea abdominal distention paralysis of the bowel, and hic coughing

The latter complication is particularly distressing It will occasionally yield to morphin in  $\frac{1}{4}$  gr doses to atropin in  $\frac{1}{16}$ -gr doses or to swallowing of chipped ice A tight abdominal binder will occasionally give relief Recently good results have been obtained from the subcutaneous injection of 3 or 4 c.c. of ether (Gibson) Gastric lavage is frequently of benefit, particularly if the patient is nauseated In some cases firm pressure on the phrenic nerves posterior and underneath the middle of the sternomastoid muscles will give relief

For abdominal distention and intestinal paralysis a big hot pack or an electric pad over the abdomen will often give marked relief

Head cases should be propped up in a sitting position immediately after operation and kept so for forty eight or seventy two hours in order to diminish intracranial tension and lessen the possibility of venous oozing in cases of high blood pressure

They may be given tap water by rectum and sedatives as required. From 15 to 30 gr of triple bromids three times daily for from four to six days after operation will often render the postoperative course easier. For an intense throbbing headache morphin is frequently the only satisfactory remedy, but this should be used with caution and only upon the surgeon's orders since it may obscure the onset of complications.

In cases in which headache is due to increased tension, lumbar puncture may be the only means of obtaining relief. Before lumbar puncture is carried out the effect of a hypertonic solution should be given a trial. Eight ounces of 25 per cent magnesium sulphate given slowly as an enema to be retained is the simplest and most effective method.

**Spine Cases**—After laminectomy patients should be kept on the face for twenty four or forty eight hours, and then they may be carefully turned on the back. They should always be placed on an air or water-mattress. Cases with absolute incontinence of the rectum and bladder should be placed on a Bradford frame, or some modification of it, that will permit the patient to be raised and lowered without disturbing him.

Difficulty in urination and defecation, postoperative pneumonia, and the development of bed sores are the serious and common complications. Strychnin in  $\frac{1}{10}$ -gr doses t i d will sometimes help to restore tonicity of the bowels and bladder. Pituitrin is of value in an emergency, but cannot be used indefinitely.

Triple bromids, veronal, or sulphonal in liberal doses will help to keep the patient comfortable during the early postoperative course. Opiates should be avoided as much as possible because of their inhibitory effect on the bladder and bowels.

**Thyroid Cases**—Cases of thyroid toxemia demand the most exacting preoperative and postoperative care. They are frequently desperately ill when they enter the hospital. They must have absolute rest and fluids without fail. The former may require bromids, luminal, or morphin, depending on the seriousness of the case. In severe cases fluids may best be given subcutaneously, as 1 7000 novocain solution without adrenalin.

Ten or 20 per cent glucose solution intravenously is of value, particularly if the patient is in a state of acidosis. Lugol's solution is given by mouth in doses of 10 to 60 minims daily, beginning with 10 or 15 minims and increasing rapidly unless the patient responds promptly. The effect of this should be watched carefully especially in toxic adenomas. With desperately sick patients laboratory examinations, such as metabolic rate determinations must be foregone until the patient has improved. No type of surgical emergency requires more prompt, energetic, and wisely directed action than the very toxic goiter patient.

After operation thyroid patients should be propped up in bed immediately and kept so for forty eight hours. An ice-bag should be laid over the heart and proctoclysis started immediately. Sedatives should be given in sufficient quantity and often enough to keep the patient quiet. During the first forty eight hours morphin every six hours or even oftener may be necessary to prevent the patient from fidgetting or thrashing about and putting added strain on a weakened heart muscle. If morphin is ineffective  $\frac{1}{15}$  gr of scopolamin may be added to  $\frac{1}{6}$  gr doses of morphin. Lugol's solution 40 to 50 minims daily, 15 minims to the pint should be given by rectum for forty eight or seventy two hours.

If the patient's temperature reaches 101° F she should be sponged with cool water and ice bags placed over the thighs and under the arms. If it rises to 103 5° F she should be packed in ice until the temperature drops to 100° F (Crile). The temperature will keep on receding for some time after the ice has been taken away. An ice pack may be applied by slipping a big rubber sheet under the patient and lifting up the sides and ends so as to form a tub. A muslin sheet should separate the ice from the patient's body.

Under no circumstances should the patient be allowed to raise herself or exert herself during the first few days after operation. Sudden cardiac collapse may be brought about by very slight exertion.

For the sticky cough that occasionally follows thyroidectomy elixir of terpene hydrate with codein is usually helpful. Inhalation

tions of steam or of tincture of benzoin are often much appreciated by the patient.

Drains should be removed in twenty-four or forty-eight hours.

Cases of non-toxic goiter present fewer difficulties. They rarely require cardiac stimulation and are not nearly so sick following operation. Drains, if used, may usually be removed in twenty-four hours.

**Empyema.**—The essential factors are adequate drainage and maintenance of the normal negative intrathoracic pressure so that the lung on the affected side may be constantly drawn out to the chest wall and the empyema cavity obliterated.

Drainage is secured by inserting a tube between the ribs or in the space formed by resection of a portion of a rib and attaching to this tube some form of suction apparatus. If the case is one of several weeks' duration and the walls of the cavity are already firm from plastic exudate, suction secured with the aid of a water pump and controlled by a mercury manometer is the most effective method. Children frequently respond satisfactorily to a very simple method: aspiration of the pus three times a day through a catheter inserted between the ribs. Care should be taken that the syringe is unfastened and that the clamp is tightened again before the syringe is removed, so that air is never permitted to enter the pleural cavity and form a pneumothorax.

The use of Dakin's solution is undoubtedly of value in clearing up the infection, in dissolving the thick exudate that lines the walls of the cavity, and in neutralizing the toxins formed by the infecting organisms. By dissolving the thick exudate formed on the walls of the cavity it makes drainage free and more complete. It can be introduced through a Y tube inserted in the tube which drains the pleural cavity. The suction apparatus can be closed off temporarily every two hours by means of a clamp, Dakin's solution introduced through the Y tube, and permitted to remain for fifteen minutes, after which suction can be started again.

In the case of a child it may be sufficient to aspirate the pus through the catheter and irrigate the cavity with Dakin's solu-

tion three times daily until the fluid returns clear. Between irrigations the tube is clamped tightly so that no air can enter the pleural cavity at any time.

As the plastic exudate lining the cavity walls is dissolved the lung will gradually expand and resume its normal position if the negative pressure within the thorax is constantly maintained. If air is allowed to rush into the pleural cavity at frequent intervals, the lung will be compressed and forced away from the chest wall and recovery constantly retarded. Expansion of the lung can be hastened by having the patient practice deep respiration for fifteen minutes at a time a number of times during the day by the use of blowing bottles, by setting up exercises etc.

When the temperature has remained normal for a week and the aspirated contents are sterile or contain only a few organisms per field, suction and irrigation may be replaced by intermittent irrigation through a small catheter. The wound is permitted to heal as rapidly as possible. During this period the use of blowing bottles is particularly important to keep the lung expanded as completely as possible.

**Bone Cases**—Preoperative cleansing of the field of operation cannot be overemphasized. Dead scaly skin should be removed. If osteomyelitis and sinuses are present careful washing with soap and water should precede operation.

After operation tap water by rectum should be started immediately. Bone operations are frequently prolonged. The patient often a youngster, is saturated with ether. If the medullary cavity is reamed out or a bone peg inserted, a certain degree of shock frequently follows. Under such conditions maintenance of fluid intake by proctoclysis or hypodermoclysis for forty-eight or seventy two hours immediately after operation becomes doubly important.

**Operations on the Kidney, Bladder, and Prostate**—Preoperative preparation—particularly the forcing of fluids for several days before operation and bringing kidney function to the highest possible level—is especially important. Water, lemonade, citrated drinks, and alkaline drinks are all helpful. Glucose so-

lution intravenously furnishes fluid and food, and counteracts the toxemia due to impaired renal function.

After any operation on the genito-urinary tract particular attention to postoperative treatment is required. Failure of elimination for even a brief period of time may result fatally, for patients are frequently debilitated, not uncommonly they have had some urinary retention for a considerable period and their condition rapidly becomes a matter of grave concern.

After operation fluids must be given in adequate amounts. Fluid may be given by mouth as soon as nausea has subsided. Food may be given as soon as tolerated; carbohydrates are assimilated more readily than proteins. In general, the diet should be that given to a nephritic.

If a nephrectomy has been done and gauze drainage left as a pack, it should be removed gradually after forty-eight hours and be completely removed at the end of ninety-six hours. If a clamp is left on the pedicle of the kidney, it may be loosened at the end of forty-eight hours, and completely removed twenty-four hours later.

After cystostomy some form of suction is of great help in keeping the patient dry and comfortable. Rendering the urine acid by the use of acid sodium phosphate or sodium benzoate (preferably the former) will help diminish cystitis and prevent the encrusting of the tube with phosphates. If cystostomy is performed preliminary to prostatectomy the tube may be left in place until the prostate is removed.

Following prostatectomy gauze drainage left to stop oozing should be removed within twenty-four hours. If a Hagner or Pilcher bag is left in place it should also be removed within twenty-four hours. In removing the bag the tension on the catheter coming from the bag should first be partially released six or eight hours after operation by loosening the straps which hold it to the thigh. A few hours later the water may be allowed to escape from the bag by loosening the forceps left on the abdominal tube, but the patient should be watched very carefully for the next two hours for signs of hemorrhage. If bleeding

should occur when the catheter strapped to the thigh is loosened or the bag emptied of water, tension should be reapplied and the bag refilled. If no bleeding occurs the bag may be withdrawn twenty four hours after operation and a sterile catheter drawn into the bladder as the bag is drawn out. The catheter must be carefully strapped to the penis so that it is not inadvertently withdrawn by the patient. Still better than strapping is the insertion of a silk ligature, which passes out through the abdominal wound in the tip of the catheter. Such a ligature can be inserted by drawing the tip of the catheter out through the abdominal wound when the bag is withdrawn. Usually after the abdominal drainage is removed the soft tissues will fall together and render the abdominal wound water tight. If not, the stitches may be reinforced by adhesive straps.

Should the catheter which has been drawn into the bladder slip out of place it is wiser to let the urine escape through the abdominal wound than to attempt to insert a catheter through the urethra. If the urine does not escape freely a stitch or two must be removed from the wound and a forceps passed gently into the bladder. In some cases it may seem wise to insert a tube in the abdominal wound and to leave it for a few days to secure perfect drainage.

At the end of ten days the stitches and the retention catheter may be removed. By strapping the wound tightly so as to approximate the edges as completely as possible healing will take place quite rapidly. Should the urine be obviously infected, irrigation of the bladder with boric solution or Dakin's solution should be carried out once daily.

Attention to the quantity of fluid intake, to nutrition, to the avoidance of postoperative pneumonia by turning the patient from one side to the other, and by getting him out of bed as early as possible are all important details in postoperative treatment.

At times following prostatectomy a patient will fail to urinate through the urethra as promptly as he should. In such cases large sounds should be passed gently to prevent the formation of a stricture at the site of the healing wound.

**Cystoscopy**—A patient should be given 6 glasses of water before coming to the operating room for cystoscopic examination, so as to ensure rapid excretion during the examination. After the examination he should have a hot water bottle over the bladder and 15 gr of triple bromid immediately. If iodid solution has been injected in the kidney pelvis it may be wise to give  $\frac{1}{4}$  gr morphin after the examination though patients vary considerably in their reaction to pyelography.

After examination patients should be urged to keep on drinking as much water as possible so as to flush the urinary tract with the largest possible amount of fluid.

**Hemorrhoidectomy**—After hemorrhoidectomy the bowels should be kept closed for three days with powdered opium, gr J, daily, or some other opium derivative.

On the fourth day a cathartic may be given, such as milk of magnesia in divided doses, and a few hours later an oil enema through a catheter, not an ordinary colon tube.

As soon as the patient is strong enough to sit up out of bed he may sit in a tub of warm water for five to ten minutes daily, being careful to dry himself thoroughly thereafter. No other form of treatment is so effective in relieving the soreness and tenderness about the rectum as a warm bath.

**Hand Cases**—With infected hands a big hot dressing is applied immediately after operation. A few openings are usually made through the bandage and waxed paper so that hot solution may be poured directly on the sterile dressing without removing the bandage. Hot solution should be added sufficiently often to keep the dressing moist, but one must depend for heat rather on hot water bottles on the outside of the dressing, or an electric light above it, for it is impossible to keep a large dressing hot by the addition of hot solutions without saturating everything about the patient.

As soon as the drainage material is removed the patient may substitute a hand bath or arm bath for twenty or thirty minutes two or three times daily for the hot pack. After each soaking the hand should be dried thoroughly under the electric light for an hour or two. Prolonged use of hot packs will cause undue

swelling and maceration of the soft tissues and also make early mobilization of the fingers and joints more difficult to carry out

Skin grafts should not be dressed for from five to eight days unless there is evident suppuration about the graft. After the first dressing pressure should be reapplied at each dressing and maintained in the case of full thickness grafts for two or three weeks. Thiersch grafts may be dressed without pressure after the primary dressing if healing has occurred.

Zeroform gauze or a substitute should always be applied next to the graft before a dressing is replaced.

If evident infection has occurred a wet boric dressing changed every twelve hours is substituted for the zeroform gauze and dry dressing. Pressure is maintained over the wet dressing. If pressure is maintained with sponges the sponges should be washed and wrung dry at each dressing so that they will adapt themselves to the contour of the wound.

#### POSTOPERATIVE COMPLICATIONS

**Postoperative Hemorrhage**—No postoperative complication requires more prompt and wisely directed interference than hemorrhage. An important fact to remember is that a very little pressure will stop bleeding *if the pressure is applied in the proper place*. If the hemorrhage is in such a location that the source of bleeding can be seen the application of the needed pressure is a simple matter. If it cannot be seen the source of bleeding must be exposed and as promptly as possible.

Packing will stop hemorrhage temporarily but if the operative field is infected—as in an infected hand osteomyelitis etc.—the bleeding is bound to recur. Ligation which may include to advantage some of the surrounding soft tissues is then the only recourse. In case of doubt as to whether the ligated tissues have sufficient vitality it is wiser to ligate through a fresh incision proximal to the site of the wound.

After ligation has been carried out blood transfusion will help to replace the lost blood and prevent further hemorrhage. In cases of parenchymatous hemorrhage or continued oozing

from an extensive surface, hemostatic serum is of value. Blood transfusion is, of course, specific.

Acute dilatation of the stomach is evidenced by repeated vomiting which is often apparently painless and effortless, and by abdominal distention. This condition should never develop if a patient is carefully watched. Gastric lavage, repeated as often as necessary, will keep the stomach empty. If vomiting continues after one or two washings the stomach tube may be left in place and the stomach contents allowed to siphon off.

Turning the patient on his face and elevating the hips will relieve the downward pressure of the stomach on the bowels and the resulting traction on the mesentery which is believed to be an important factor in the etiology of acute dilatation.

**Pleurisy Pneumonia**—Strapping the side of the chest with broad strips of adhesive will frequently relieve a painful and distressing cough.

Postoperative pneumonia should be anticipated, particularly in elderly patients by keeping the patient warm during and immediately after the operation, particularly while the dressings are being applied and while the patient is on the way to his room, by turning the patient from side to side in bed, by propping him up in bed as soon as possible, and by encouraging deep and prolonged respirations several times daily in order to force as much air as possible into the lungs, and to combat the venous stasis that accompanies a weakened heart action. Support of the heart by digitalis in some form is important. Such patients should be kept warm, they should be fed frequently, and with small quantities at a time, they should not be allowed to become distended with gas, for the lungs are already sufficiently handicapped without being encroached upon by a tense diaphragm.

**Retention of Urine**—Postoperative retention may be relieved by hot applications to the lower abdomen, by a warm douche, by massage of the prostate, or by an enema. Sometimes sitting up in bed or sitting on the edge of the bed will prove effective.

A catheter should be the last resort, but one must not permit the bladder muscle to become paralyzed before using the

catheter. If the muscle is once paralyzed recovery becomes a matter of several days.

#### GENERAL DETAILS

Stitches.—In the average case skin-clips or stitches should be taken out on the sixth or seventh day and retention sutures two days later. In thyroid cases or after plastic operations on the face clips should be taken out on the fourth day so that the marks of the points will not remain as white scars; other sutures should be removed on the sixth day. In old or debilitated patients or patients with malignant disease skin sutures should not be removed before the tenth day and retention sutures before the twelfth or fourteenth day unless they are cutting through the skin. In cases of penneal repair the stitches may be taken out on the tenth day.

Following removal of the stitches wounds should be strapped snugly with broad adhesive tape to prevent separation of the skin edges. The tape should be narrow where it crosses the suture line and the edge of the tape inverted so that the adhesive material is not in contact with the suture line.

If a patient develops an irritative bronchitis after an abdominal operation an abdominal binder should be applied to form an additional support for the suture line when the patient coughs. In such cases removal of the sutures should be delayed several days and the suture line should be reinforced with adhesive tape before all the sutures are removed.

Dressings should be as thin and light as possible so as to prevent perspiration underneath the dressings and maceration of the tissues about the wound. In infected cases the dressings should be applied so as to retain the drainage material at and below the most dependent portion of the wound. With a suppurating appendix for example, the larger part of the dressing should be along the flank outside the incision rather than upon the abdomen.

The skin should be protected from irritating discharges by the application of a thick layer of sterile vaselin or zinc ointment or the application of vaselin strips about the wound. The skin

about the wound should be cleansed as carefully as possible with alcohol or benzine at least every forty-eight hours, since oily substances form good culture-medium for bacteria.

**Infected Wounds.**—If a clean wound becomes infected a culture should be made as soon as signs of infection appear.

With a simple stitch abscess the removal of one or two sutures and the application of a hot moist dressing for a few days will usually suffice. If the infection is more serious, the insertion of a tube and two hourly irrigations with Dakin's solution will help to clear it up promptly. Not infrequently a bit of infected catgut or necrotic tissue will cause suppuration to continue until the offending material is removed or spontaneously discharged.

**Getting Up from Bed.**—Patients may usually sit up in bed on the third or fourth day, and get up out of bed as soon as they feel sufficiently strong. Exceptions to this rule are toxic thyroid cases, and cases with perineal repair, or hernia. The former may get up when the condition of the heart and pulse justifies it; one must be guided by the indications in any particular case. Perineal cases and hernia cases should remain in bed for ten days after operation and remain fairly quiet for fourteen days.



## CLINIC OF DR DANIEL N EISENDRATH

MICHAEL REESE HOSPITAL

### UNDESCENDED TESTIS AND EUNUCHOIDISM

THE subject of today's clinic is one which is of much importance to those who follow the specialty of pediatrics or of internal medicine, as well as to those who devote their energies to the surgery of the genito urinary tract

Before presenting some patients whom I have asked to return today let us review some of the salient features of the condition commonly referred to as "undescended testis"

**Division According to Anatomic Data**—You are all so familiar with the normal mode of migration of the testis that I will only recall to your memory the fact that up to the last months of fetal life the testis lies in the abdomen close to the upper end of the inguinal canal. From this point it passes through the canal to the scrotum, where it is found at the end of intra uterine life. There is still much difference of opinion as to (a) the cause for this migration of an organ from one portion of the body to another (b) the factors which enter into a disturbance of such a normal course of migration. Let us review briefly the various theories as to both of these

**Rôle of the Gubernaculum Testis**—This is a band like structure composed chiefly of ordinary fibrous and of elastic tissue attached proximally to the lower end of the testis and having a four tailed distal insertion viz., to the lower end of the scrotum, to the pubic, femoral, and perineal regions respectively. Of these, the scrotal attachment is the most developed as a rule (Fig. 271)

**Action of the Cremaster Muscle**—The fibers of this muscle completely envelop the layers (of fascial origin) which form the coverings of the testis and spermatic cord. The action of the

cremaster muscle in pulling the testis upward voluntarily or when stimulated reflexly is familiar to you

*Action of the Muscles of the Inguinal Canal*—The internal oblique and conjoined tendon (of internal oblique and transversalis muscles) act as a form of bulwark during the latter months of intra uterine life against the return of the testis into the inguinal canal and of course into the abdomen

*Theories as to Cause of Non or Abnormal Descent*—Having mentioned these various anatomic conditions which are constant in normal individuals let us review some theories as to the etiology of undescended testis and present one of our own

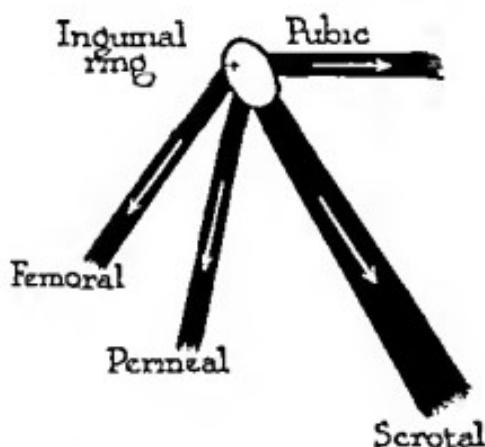


Fig. 271.—Diagrammatic representation of the four attachments of the gubernaculum testis. Arrows point toward scrotum (bottom of) pubic, femoral and perineal regions respectively (See text.)

One of the theories which has been advanced by writers up to the present time is that the adhesions of the vas and its vessels to structures in the vicinity of the internal ring is due to a fetal peritonitis. Those who know that the testis lies extraperitoneal and have observed how well protected this subperitoneal tissue is against any peritoneal infection will discard this view at once. Another theory is that of heredity but even this has few supporters. Carl R. Moore of this city has shown that the testes of animals undergo rapid degeneration when experimentally transplanted into the abdomen.

At present we have no satisfactory theory that will explain all cases so I propose to offer one which will at least help to clear up a certain proportion of the cases.

*Our Theory*—This is based purely upon faulty anatomic conditions, viz., there is a continuous contest between the gubernaculum attached to the testis on the distal side and the cremaster enveloping the testis on the other. The former attempts to pull the testis into the inguinal canal while the gubernaculum probably exerts traction in the opposite direction toward one of its four points of attachment (Fig 271). The deciding factor, in my opinion, is the sphincteric action of the muscles forming the posterior wall of the inguinal canal. If this is faulty, as the result of congenital deficiency in the development of the internal oblique and conjoined tendon (Fig 276), there is not only a failure to close the vaginal process of peritoneum which precedes the descent of the testis but the latter can be held in the canal or just beyond its external opening by the more powerful cremaster, so that the vessels and vas do not lengthen as they should. This faulty development of the internal oblique and conjoined tendon has been such a constant finding at our operations for undescended testis that I believe it plays a most important role in the arrested or faulty migration of the testis.

*Anatomic Division of Undescended Testis Cases*—The majority of writers place cases into two large groups viz.

1 Cases of arrested descent divided thus (a) Abdominal, i.e., within abdominal cavity (extraperitoneal), usually close to internal ring (Fig 272), (b) inguinal i.e., found at operation in inguinal canal between internal and external rings (Fig 272). In many of these the testis lies in the canal, but slips back readily into the abdominal cavity, (c) just distal to the external ring.

C G Mixter does not consider that these belong to the cases of arrested descent because the testis has emerged from the inguinal canal. When one examines such cases before or during operation it is impossible to draw the testis further down into the scrotal cavity than the upper end of the latter. In some cases the testis is found on the outer aspect of the external oblique aponeurosis with or without an associated hernia (Fig 273).

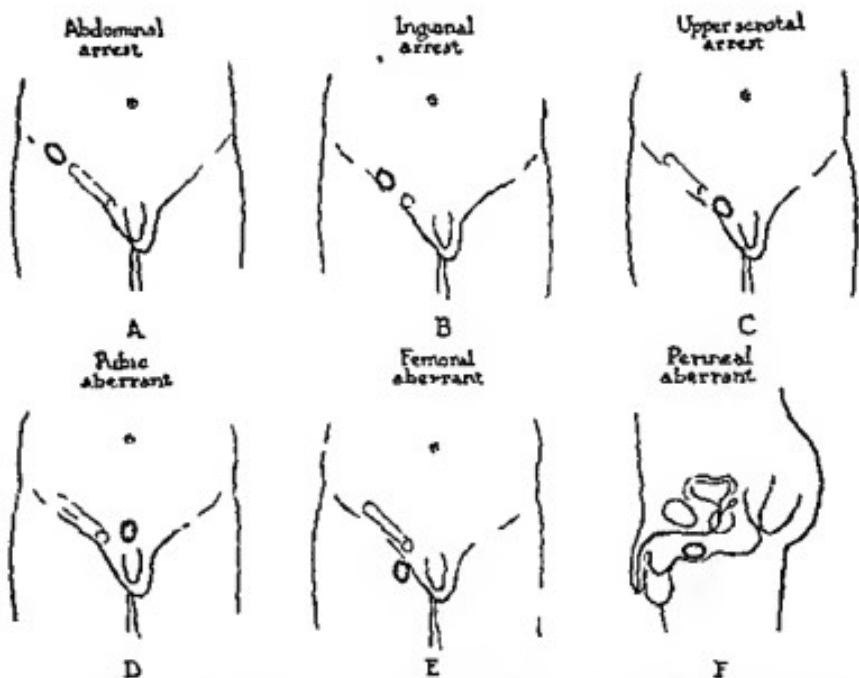


Fig. 272.—Diagrams of the locations at which the testis can stop in its descent toward bottom of scrotum and at which it may be turned aside from its normal course

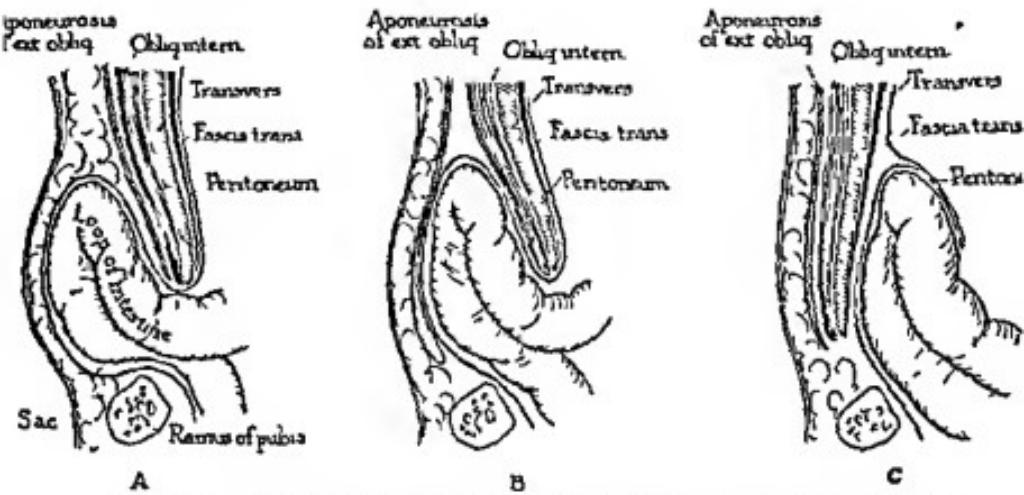


Fig. 273.—Varieties of interstitial herniae which may complicate arrest of the testis. A Subcutaneous, in which sac and testis are between skin of inguinal region and external oblique aponeurosis. Instead of a simple sac such as this there may be an hour glass variety with extension toward or into the scrotum. B Interparietal form with sac between external and internal oblique muscles. C Properitoneal form with sac between peritoneum and transversalis fascia.

It would seem only just in our opinion to include under arrested descent all cases in which the testis is found beyond the external ring but cannot be brought down into the scrotum proper. We use the term "upper scrotal" or "superficial inguinal" (between skin of abdomen and external oblique) to designate these cases and place them in the group of arrested descent cases.

2 Aberrant or faulty descent. This term is applied to those cases in which the migration or "descent" of the testis is not arrested in its normal course (abdominal, inguinal, upper scrotal Fig. 272), but in which the testis wanders or is caused to deviate from the route which it would ordinarily follow toward the lower end of the scrotum, into "aberrant or faulty" paths, viz., to the pubes Scarpa's triangle or perineum. When we recall these other three attachments of the gubernaculum (Fig. 271) it is not difficult to visualize how the testis is directed away from its normal course (toward the scrotum) into one of these aberrant routes. These are:

1 The pubic, in which the testis is found above the symphysis pubis (Fig. 272)

2 The femoral, in which the testis is found over Scarpa's triangle (Fig. 272)

3 The perineal, in which the testis is found either in the perineal region proper or lateral and external to the scrotum (Fig. 272)

To these two groups (viz., arrested and aberrant or faulty descent) we will add another to which comparatively few writers refer. The terms "migrating," "wandering" or "elusive" might all be applied to this class.

3 "Migrating' testis. By this we mean the cases in which on one or both sides the inguinal canal (and of course its upper and lower openings) is so wide (as the result of congenital deficiency of the internal oblique and conjoined tendon) that the testis is able to move freely in an upward and downward direction (Fig. 275). Let me illustrate this upon a little boy of ten whom we will examine. You will note that the right half of the scrotum is empty because the testis has been arrested in its descent just distal to the external ring and cannot be drawn down any farther.

ther into the scrotum. In other words, we are dealing with the upper scrotal type of arrested descent of which I have just spoken. Now let us examine the left half of the scrotum. We can feel a testis of normal size for the boy's age and quite mobile in the scrotal cavity. Now let us see whether we can cause this



Fig. 274.—Subcutaneous form of interstitial hernia associated with non descent of the testis (author's case). Note hour glass form of the sac, the testis lying in the lower half, its position indicated by the dotted line

testis to disappear into the inguinal canal by a form of taxis such as is employed in reduction of a hernia

Even without our manipulation observe how the testis can be drawn voluntarily by the boy not only into the inguinal canal but also into the abdominal cavity. Upon straining the boy can force the testis to descend again into the scrotum just as a patient with an inguinal hernia can cause the contents of the

sac to be forced from the abdomen into the canal and from here into the scrotum whenever he strains or coughs

This condition of 'migrating' testis is a very common finding in infants who can pull the testes well up into the inguinal canals or even abdomen when they cry, or push them out when they strain. Toward puberty such an ability of the testes to wander up and down becomes, as we shall see shortly, of considerable clinical importance and is as much of an indication for operation as an arrested or aberrant descent would be. Infants should be watched because we believe that this constant migration of the testes if it does not cease spontaneously toward puberty will have an influence upon the development of the testes and of course, on its interstitial cells with a resultant effect upon the faulty evolution of the secondary sex characteristics to be spoken of shortly under Eunuchoidism.

The factor which favors this ability to pull the testes lies, of course in the power of the cremaster to overcome the weak resistance of poorly developed muscles forming the inguinal canal. Recently we have advised operation for such abnormal mobility of the testes at an age say ten years, much earlier than in former times before we had an opportunity to observe the reciprocal influence of such an ability to migrate, upon the development of the organ.

**Conditions Which Accompany or Develop as the Result of Arrested or Aberrant Descent or Abnormal Mobility (Migrating) of the Testes**—The patients whom I present today illustrate almost every phase of such concomitant or complicating conditions. These are the following:

1 *Hernia*—This is an accompaniment of a large percentage. It is usually of the indirect inguinal variety, complicated in some cases by a sliding hernia of the cecum or sigmoid. In a small percentage of cases the hernial sac is of the interstitial variety, as was found at operation in 2 of these patients. In one the sac was unilocular, and with the testis on its posterior aspect extended up between the skin of the inguinal region and the external oblique aponeurosis. In the second patient there was an hour glass sac with the testis just at the external ring. The

upper half was found in the same location (Fig 274) as in the other boy, while the lower half of the bilocular sac extended into the scrotum.

There are three varieties of interstitial hernia which may accompany arrested descent of the testis (*a*) the subcutaneous (Fig 273), as in the first case just mentioned, (*b*) the interparietal, where the sac and often the testis (Fig 273) extend upward between the internal and external oblique muscles, and (*c*) the properitoneal form, in which the sac and usually the testis are found between the transversalis fascia and the peritoneum, *i.e.*, in the subperitoneal areolar tissue (Fig 273).

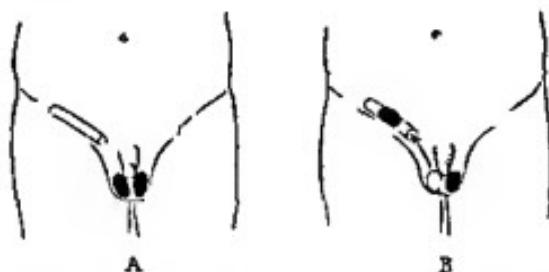


Fig 275.—Diagrams of change in position of migrating or abnormally movable testes (uni or bilateral). A Both testes in scrotum and can be held there by examiner. B One testis (right) has slipped up into the inguinal canal (in direction of arrow) and corresponding half of scrotum is empty. Former location of testis represented by dotted oval.

In connection with this subject of hernia with undescended testes let me direct your attention to two other features, one, that a well developed hernial sac may extend into the scrotum, etc., and the testis still be at the level of the external ring or inside of the inguinal canal. Another anatomic condition to be constantly borne in mind in operating, especially on young adults, is the presence of a sac extending into the scrotum and the vas forming a loop on its outer surface from the inguinal canal down to the bottom of the scrotum and back again to the testis which has not descended farther than the external ring. It can be understood that division of the vas would be easy if such a possibility were overlooked.

*2 Atrophy of the Testis*—According to Ufreduzzi and other investigators an absence of spermatogenesis is found in about 90

per cent. of the cases in which complete descent has not occurred at the age of puberty. The atrophy involves chiefly the spermatogenic cells and only comparatively rarely the interstitial cells of Leydig. Several of the cases which we present today showed a marked degree of atrophy at a comparatively early age—in one at eight years. In the majority of cases of successful orchidopexy the testis develops rapidly if the atrophy is not too advanced and the operation has been performed early enough to permit further development to occur. We shall refer later when we speak of eunuchoidism to the relation of such atrophy to hypogenitalism and to sterility.

3. *Development of Neoplasms.*—It was formerly believed that a neoplasm was much more likely to develop in a testis which had not migrated properly than in one which had done so. There is still some difference of opinion; for example, Mixter thinks that the undescended testis is more likely to be the seat of a neoplasm. Eccles and Coley hold the opposite view. Cunningham in a series of 452 neoplasms of the testis found that in nearly 10 per cent. the organ had not descended. When we compare the percentage of normally with that of imperfectly (arrested) testes which is certainly higher than 9 to 1, it would seem as though neoplasms occurred relatively more commonly in the undescended organ.

4. *Eunuchoidism or Hypogenitalism.*—This syndrome, which is quite often seen in cases of arrested, aberrant, and migrating testes, is one which has not received the attention which its importance merits. Let me present these 2 patients who illustrate two different types of eunuchoidism.

**Case I.**—This young man was first seen about ten years ago. His family physician told him to wait until after puberty in order to see whether the testes, which had never entered the scrotum, being arrested in the inguinal canal, would not descend spontaneously. Finally, at the age of seventeen, the young man was advised to have a bilateral orchidopexy done. At that time he was tall, with upper and lower limbs which were much longer proportionately than the trunk proper, giving him a rather

awkward appearance. His voice was high pitched there was a complete absence of hair on the face thorax and pubes. The penis was very small. The scrotum was empty both testes being palpable in the inguinal canal. He was very intelligent and did not complain of headache or any symptoms indicative of pituitary disease.

We made a diagnosis of eunuchoidism due to absence of development of both non descended testes. The young man was informed that orchidopexy alone had but little to offer. At operation we found both testes greatly atrophied but succeeded in bringing them down to the lower end of the scrotum. Today the eunuchoidism seems unchanged the testes are in the scrotum but are no larger than ten years ago and a condition of mental depression is now present.

**Case II**—Boy of fourteen who was referred six weeks ago for a right orchidopexy. You will observe the abnormal degree of obesity for his age. The deposits of fat are especially marked over the mammary regions as well as over the hips and lower half of the abdomen. His height is below the average for his age and the skin is as soft as that of an infant. The left testis was found at our first examination to be in the scrotum and of normal size. The right testis before operation was of the migrating or elusive type described earlier in this clinic. At times one could feel it in the scrotum then it would slip up into the inguinal canal from which the patient had learned to push it down again into the right half of the scrotum. At operation we found a marked deficiency in the development of the internal oblique and conjoined tendon as well as a very large external ring. The testis itself was greatly atrophied and could be brought down into the lower end of the scrotum. Today (six weeks after operation) we find that it can be felt just distal to the external ring but is prevented by our hernioplasty from moving any higher.

**Discussion**—Now these 2 cases represent the two chief types of eunuchoidism seen in association with cryptorchidism: *i.e.* in either arrested aberrant or migrating testes. The chief characteristics of these two types are

*Type 1* Predominance of skeletal changes The outstanding feature is as in Case I, the unusual length of the upper and lower limbs as compared to that of the body

*Type 2* The adipose type, in which the fat deposits are predominant as in Case II

Symptoms which are common to both types and may be present to a variable degree in both are the following

(a) Lack of development of the external genitalia

(b) Dystrichosis *i.e.* absence of hair on the face thorax, pubes and extremities

(c) Psychic disturbances

It will be seen that these changes are closely related to those observed in disease of the pituitary body, viz., in anterior lobe lesions In the latter we have overgrowth of the long bones before the epiphyses are closed In tumors of the posterior lobe we observe symptoms of intracranial pressure as well as the syndrome first described by Froelich in 1901, and termed *dystrophia adiposogenitalis* whose characteristics are identical with those of the adipose type of eunuchoidism as illustrated by our Case II

Primary eunuchoidism is due to deficiency or absence of the hormone secreted by the interstitial cells of Leydig of the testis These suffer less seriously than do the spermatogenic cells in cases of arrested, aberrant, or migratory cases of undescended testis However, they do not develop as they should under normal conditions with resultant ill effects upon the evolution of secondary sex characteristics The chief difference between primary eunuchoidism as seen in cases of the three forms (arrested, aberrant, and migrating) of undescended testis and the secondary eunuchoidism is the absence of evidence of pituitary disease in the primary form Why the latter develops in some cases of cryptorchidism and not in others is not yet understood The lesson to be learned, however, is not to delay operative intervention too long in all cases This leads me to speak next regarding the proper time to operate

**Proper Time to Operate**—This is not a settled question Coley formerly advised waiting until the age of ten, but now, I

believe, operates at an earlier period. The same is true of Bevan and Mixter. I am convinced that the earlier an operation is undertaken, the less danger exists of a possible atrophy of the testes. There seems to be some relation between the position of the testes in the scrotum and their development. Moore, whom

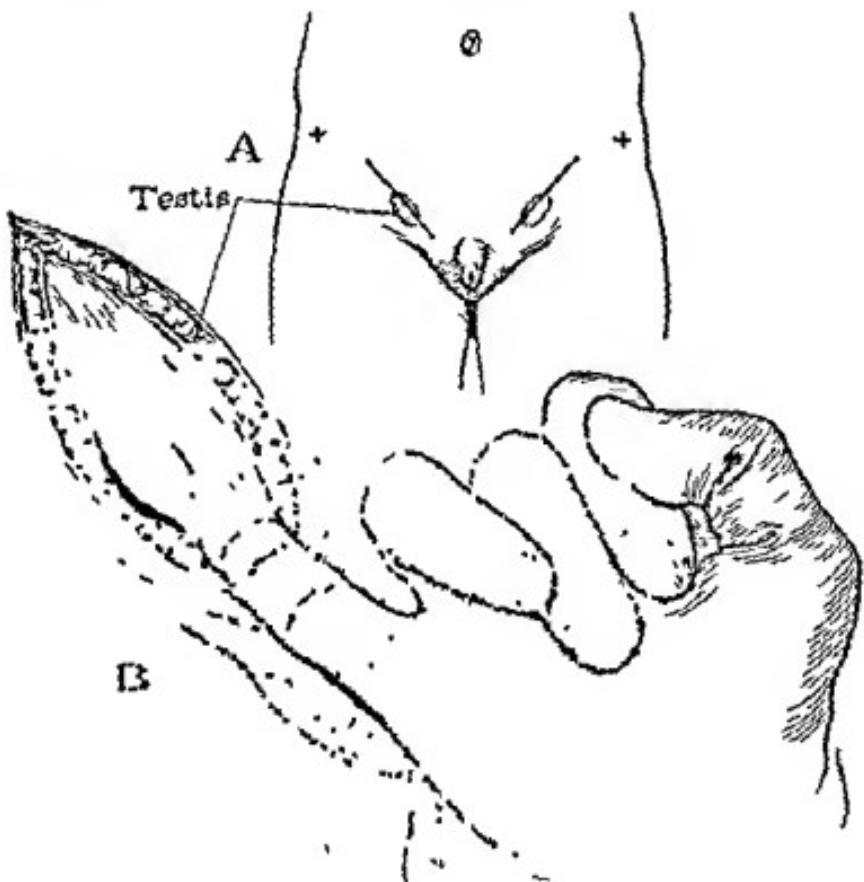


Fig. 276—A Most frequent location of testes either within inguinal canal or just beyond external ring. B Poorly developed intercolumnar fibers allowing little finger to be inserted through external ring for quite a distance.

I quoted earlier in our lecture, found that in animals there was a rapid atrophy of the testes when transplanted into the abdomen. Since there is almost general agreement that in nearly 90 per cent. of the cases of undescended testes which go beyond the tenth year there is an absence of spermatogenesis, and in a certain percentage also a tendency to eunuchoidism due to faulty

development of the interstitial cells of Leydig, I cannot see any reason why early operation should not be advised, and I have made it my practice to operate very early cases in which the testes cannot be brought down further by traction than just beyond the external ring, the type of arrested descent to which I have applied

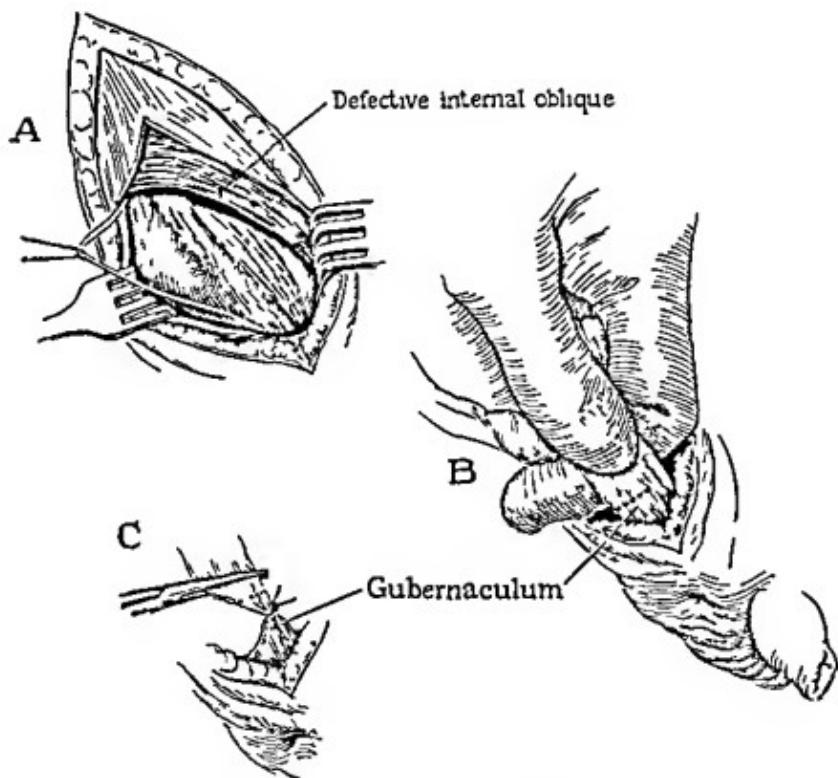


Fig. 277.—A. Inguinal canal opened, showing congenital deficiency in development of conjoined tendon and arching fibers of the internal oblique Ilio-inguinal nerve held aside. B. Gubernaculum held between index-finger and thumb before being divided at dotted line. Distal portion should be ligated (C) because it often contains a small vessel Note its point of attachment where scrotum is retracted in C.

the name "upper scrotal." Everyone who has had occasion to perform orchidopexy for arrested or aberrant testes will agree that the chief obstacle to complete replacement to the bottom of the scrotum are the many fibrous bands binding the vas and its vessels to the surrounding structures and the inability to mobilize the vas and its accompanying vessels without complete division

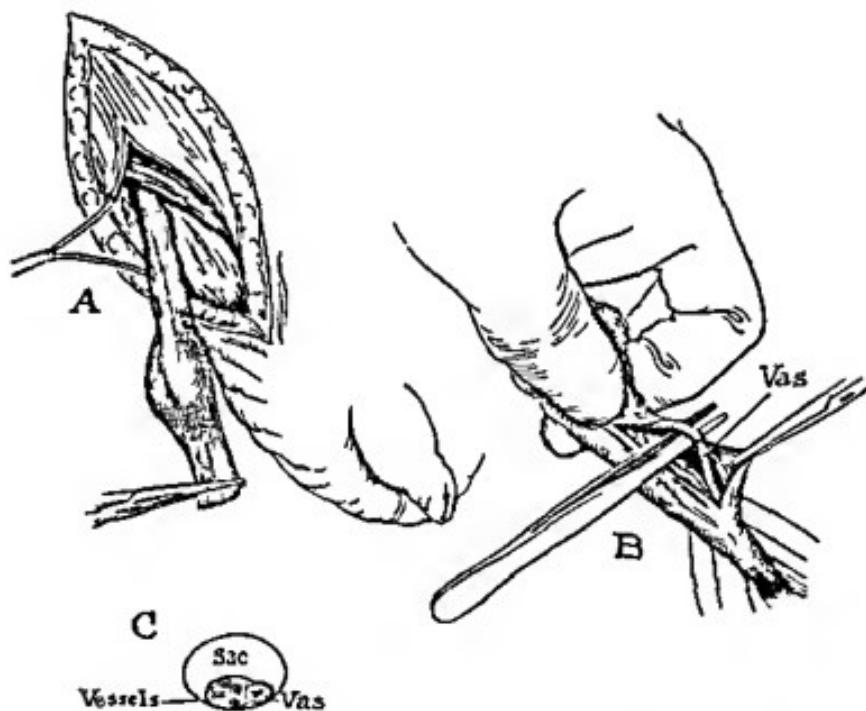


Fig. 278—A After division of the gubernaculum (see Fig. 277) the distance which testes can be brought down is estimated for first time. B Separation of vas and veins from outer aspect of sac. They lie in compartments as seen in C in outer wall of sac and can be easily overlooked unless sac is put on the stretch as shown in A. Very fine instruments should be employed.

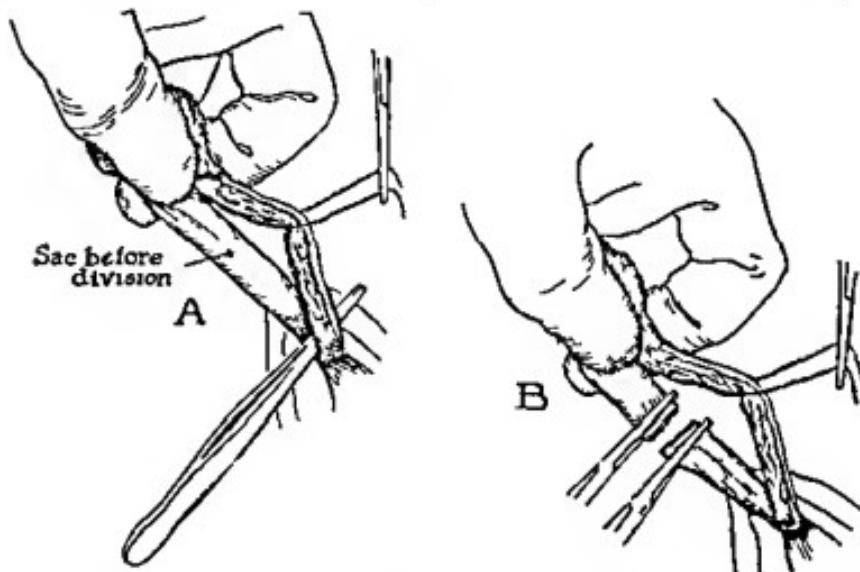


Fig. 279—A The vas and vessels have been isolated and held aside with a loop of catgut or silk. B The sac is divided into a proximal and distal portion as far as possible from the internal ring.

of all these adhesions. As soon as they are liberated one finds that there is a long vas and vessels. At the present time I do not consider it inadvisable to operate as early as the third year if the indication as outlined exists. In those cases in which I perform orchidopexy at such an early age the development of the testis has been very rapid, but in those cases in which we advised

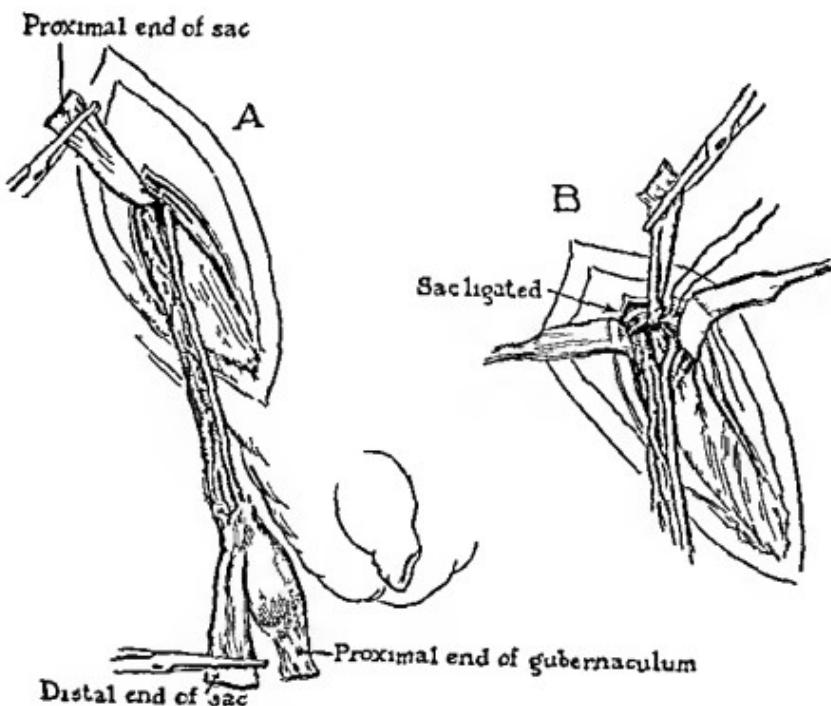


Fig. 280—A Before the proximal portion of the sac has been ligated the testis is brought down beyond lower end of scrotum in order to determine whether any further mobilization of the vas or its vessels, or both, is necessary. B The sac is ligated high up after one is sure that the testis can easily be brought to bottom of scrotum. Too early ligation of proximal portion of sac interferes with high separation and mobilization of the vessels and vas from the outer aspect of the peritoneum.

postponement we have had much cause for regret because of the subsequent atrophy. I believe that the cases that I have described as migrating or wandering or elusive testes are equally as much indications for orchidopexy as the cases of arrested or aberrant descent. There is little hope of the testis becoming fixed in the scrotum as long as it is able to slip up and down all

the way from the scrotum to the abdominal cavity as a result of a very wide inguinal canal and the faulty development of the internal oblique and conjoined tendon. I do not include in these

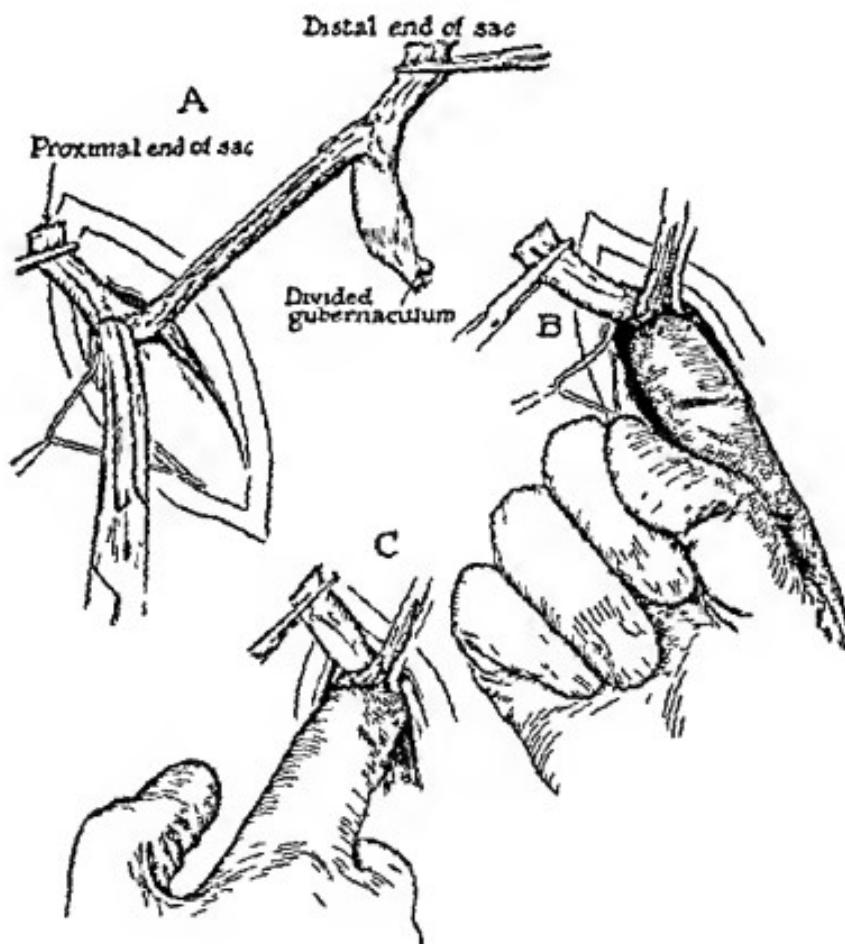


Fig. 281.—A Traction upon non ligated proximal portion of sac while vessels are separated from sac and structures of iliac fossa with aid of blunt pointed curved scissors. B Same manipulation, using index-finger instead of scissors. C The same technic as shown in A and B is employed in the direction of the bladder in order to mobilize the vas as it passes down and inward toward floor of true pelvis

cases the babies in whom the testes moves up and down and will ultimately become fixed, but, as I have said earlier in this lecture, even such children should be watched lest the condition become permanent, with resulting atrophy of the testes

**Technic of Orchidopexy.**—The technic I employ is based upon that of Dr A D Bevan with some changes of my own. Neither Dr Bevan (who is often wrongly quoted as advising ligation of the veins) nor any other operator considers it necessary to ligate the spermatic veins in order to bring the testis down sufficiently. The essential feature of our present-day tech-

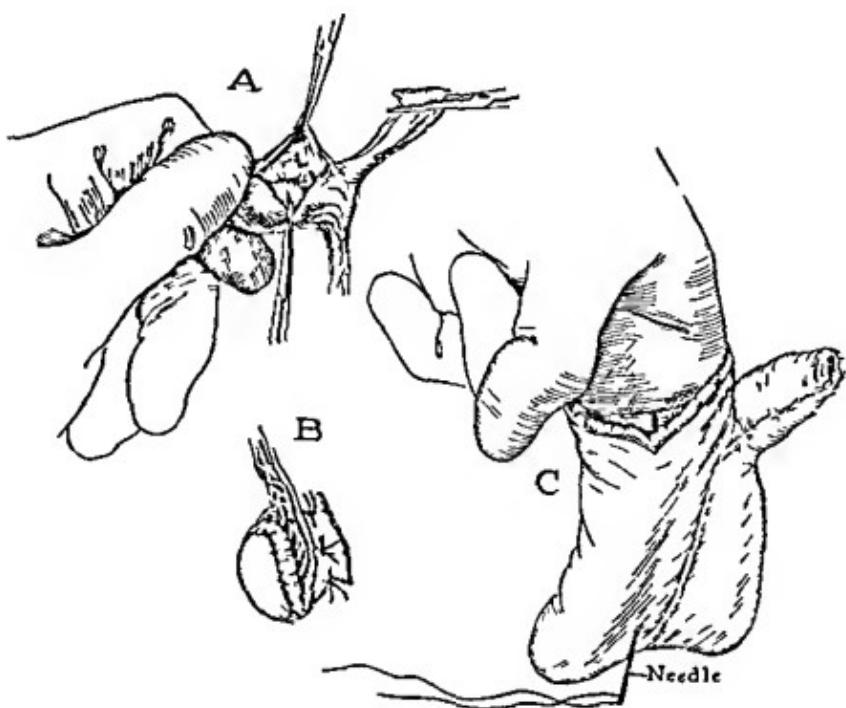


Fig 282.—A The distal portion of the sac is opened and everted around testis as in the radical operation for hydrocele. B The everted edges are united at hilum of testis. C Preparing a bed for the testis at bottom of scrotum before passing a straight long needle armed with fine silk through skin of scrotum to grasp testis (see Fig 283)

nic is high separation of the vas and its vessels in order to secure adequate mobilization. Let us consider the various steps as just demonstrated at our today's operation.

*Step 1* (Fig 276)—Expose the testis, isolate and divide the gubernaculum while keeping it stretched (Fig 277, B). Ligate the distal end of the gubernaculum.

*Step 2*—Isolate vas and vessels (Fig 278, B) from the outer

aspect of the hernial sac and pass a loop of catgut around them so that they can be retracted

*Step 3.*—Divide sac into proximal and distal portions (Fig. 279, B). Evert latter around testis to prevent hydrocele and grasp proximal portion with forceps while the vessels and vas are mobilized as high up as possible (Fig. 281) until the testis

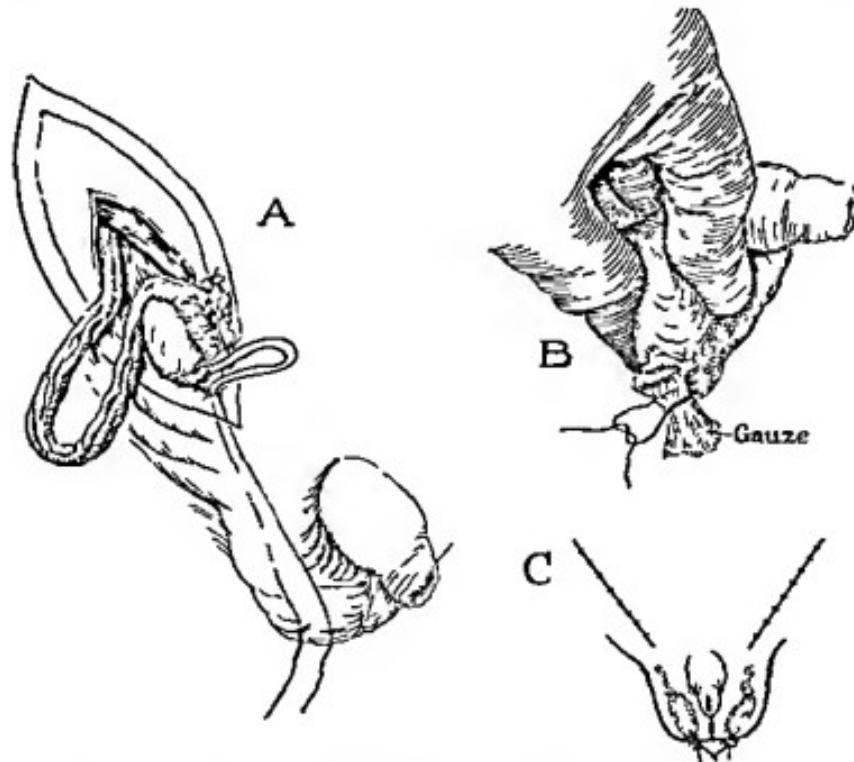


Fig. 283.—Final steps of operation. A The silk loop is passed through body of testis at its lower pole and traction made on silk until testis is held at lowermost point of scrotum. B The silk loop is then tied over a small pad of gauze and left *in situ* for ten days. C Both testes fixed to lowermost point of scrotum by the silk loops shown in B

can without much traction be brought to level of bottom of scrotum (Fig. 280).

*Step 4*—Prepare a bed (Fig. 282) for the testis to lie in the scrotum, and either insert a purse-string of catgut at the external ring, as suggested by Bevan, or fix the testis to the lowermost portion of the scrotum by means of a silk suture (Fig. 283) tied over some gauze

## CLINIC OF DR C A HEDBLOM

RESEARCH AND EDUCATIONAL HOSPITAL, UNIVERSITY OF ILLINOIS

### HODGKIN'S DISEASE WITH SPLENOMEGLY WITHOUT GLANDULAR ENLARGEMENT. SPLENECTOMY. SUB- PHRENIC ABSCESS AND EMPYEMA RECOVERY.

A MERCHANT aged forty three, came to the State of Wisconsin General Hospital complaining chiefly of weakness, dyspnea, and palpitation which he first noticed five weeks before when he had to stop and rest while climbing a flight of stairs. Since that time he had had a frontal headache, his appetite had become poor, and he had been constipated at times and thinks he had lost some weight. Occasionally he had a feeling of epigastric fulness. He also states that at times he had had spontaneous subcutaneous hemorrhages and had bled from the bowels following constipated movements.

At eleven years of age he was sick three months with articular rheumatism, and at thirty two had a cholecystostomy following two typical attacks of cholelithiasis. He stated he was not jaundiced during these attacks nor since. He was born in Russia, lived in Africa from early childhood until the age of twenty six, and in the United States since. He was married and had 4 children, living and well. His wife had one miscarriage.

He was thin and showed evidence of weight loss. The skin and sclera were of a lemon yellow tint. The tongue was flat and the normal rugae were largely smoothed out over the tip and sides. The superficial glands were palpable, but not large enough to attract any special attention. The apex impulse of the heart was visible in the midclavicular line. There was a loud long, systolic murmur transmitted to the left axilla and neck, and a centrifugal impulse was noted in the external jugular vessels.

Palpation revealed a tumor obviously the spleen, occupying the whole left half of the abdomen and producing a definite protuberance. The liver edge was palpable half way between costal margin and the level of umbilicus. The superficial abdominal veins were plainly visible.

The pupils reacted well there was no Romberg and reflexes and sensorium otherwise responded normally. The Wassermann test was negative. The only abnormal urinary findings were a few hyaline casts. There was no urobilin in a twenty four hour specimen.

*Blood Examination*

Hemoglobin	28 per cent
Erythrocytes	1 325 000
Leukocytes	2800
<i>Differential Count</i>	
Polynuclears	74.8
Large lymphocytes	4.8
Small lymphocytes	14.0
Large mononuclears	4.0
Transitional cells	0.2
Eosinophils	2.2
Color Index	1.0
Blood platelets	322 500

The patient was transfused by the citrate method on four occasions during two weeks receiving in all 1800 cc of blood. His general condition improved markedly. The hemoglobin was increased to 46 per cent erythrocytes to 265 500 the leukocyte count to 5200. Smears showed a few normoblasts many platelets polychromatophilia and a moderate amount of nuclear fragmentation. A shifting dulness in the flanks developed in the next few weeks suggestive of ascites.

A diagnosis was made of splenic anemia and splenectomy was advised. The operation was performed under combined local and ethylene gas anesthesia through a left costal margin incision. The lower pole of the spleen extended to the brim of the pelvis. The upper pole was adherent to the diaphragm. There was a large cluster of enlarged glands at the hilum. The splenic vessels were very large and tortuous. The lower pole of the

spleen was delivered through the wound and the vessels cut and tied progressively, making the operation relatively bloodless, so that the wound was closed without drain. The pulse at the end of the operation was 100 blood pressure 128 systolic. Convalescence following operation was very smooth during the first ten days. Six days after the operation hemoglobin had increased to 65 per cent and the erythrocytes to 4,190,000, but there was a leukocytosis of 22,000. On the eleventh day after operation there was a mild pyrexia and it was noted that the respiratory rate was increased out of proportion to the pulse and temperature. Examination revealed signs of fluid at right base and aspiration yielded 200 c.c. of serous fluid which showed 5000 cells to the cubic millimeter and culture of it showed short Gram-positive bacilli. Temperature pulse and respiration remained moderately elevated and the physical and roentgenologic findings continued suggestive of fluid at the right base, but no fluid was obtained on exploratory aspiration. However, on the twenty fourth day after operation aspiration in the ninth interspace in the paravertebral line of the scapula yielded frank pus.

On the supposition that the fluid was in the pleural cavity attempt was made to establish drainage by the closed method by introducing a tube through a trocar and cannula. When the trocar was removed no pus came from the cannula, but air was aspirated through it into the pleural cavity. It became evident from this that the pus was in the subphrenic space and that the pleurae were not adherent at the point where the stab was made. The patient was taken to the operating room and the tenth rib was resected. Aspiration through the diaphragm did not yield any pus. The ninth rib was then resected and aspiration in its bed in the midaxillary line yielded frank pus. An incision was then made alongside the needle through the posterior layer of the periosteum. The pleura underneath was found to be thickened. The incision was then extended, opening into a lens shaped cavity whose narrow edge only impinged on the diaphragm. The cavity was drained.

The next day the patient was in a critical condition. There was a marked elevation in pulse and temperature and the res-

piration was rapid and labored. There was dulness to percussion posteriorly and the roentgenograms showed a diffuse shadow over the whole lower thorax. Aspiration at three points posteriorly and laterally were negative but aspiration in the anterior axillary line yielded air and seropurulent foul smelling fluid. A catheter was inserted through the trocar and cannula and several hundred cc of fluid was withdrawn and Dakin's solution irrigation was instituted at once. The cavity was of about a liter capacity.

During the following seven weeks the patient was transfused twice. The subphrenic abscess healed and the empyema cavity was obliterated following a small plastic for a residual empyema sinus. The spleen weighed nearly 3000 grams. A microscopic examination of it by Bunting showed Hodgkin's disease. Submental glands which did not enlarge markedly until the latter part of the patient's convalescence were removed and biopsy showed similar pathologic findings. During the patient's stay at the hospital there was no enlargement beyond that noted at the time of admission of any of the other glands. He was discharged from the hospital in fair general condition thirteen weeks after the time of his admission.

**Discussion**—This case presents a number of interesting features both from the standpoint of diagnosis and treatment. The type of splenomegaly remained in some doubt before operation. The history of gall stones of subcutaneous hemorrhages and the lemon tint to skin and sclera were suggestive of hemolytic jaundice with splenomegaly but this was ruled out by the normal fragility test and the absence of urobilin in the urine. Alcoholic and syphilitic cirrhosis with splenomegaly and myelogenous leukemia seemed definitely excluded. Early Banti's disease was suggested by the marked anemia and the leukopenia and great size of the spleen and associated enlarged liver by the icterus and the signs suggestive of ascites.

The splenomegalic form of Hodgkin's disease without definite enlargement of the superficial glands and without evidence of enlargement of mediastinal or retroperitoneal glands had not been considered in the differential diagnosis. A superficial gland

removed for biopsy may have led to a correct preoperative diagnosis. The definite enlargement of the submental glands as stated began only toward the end of his convalescence, many weeks after the splenectomy had been performed.

Subphrenic abscess as a postoperative complication of splenectomy occasionally develops following infection of a hematoma particularly in cases in which the spleen is adherent to the dia phragm at the time of the operation. In 2 of 81 cases of sub phrenic abscess the condition followed splenectomy. The dif ferential diagnosis between subphrenic abscess and empyema ordinarily does not present special difficulty, but if the empyema lies very low between the lower aspect of the lung and diaphragm or the subphrenic abscess lies high as in this instance, the one condition may easily be mistaken for the other.

In case of doubt it has been my practice to resect a segment of the tenth rib in the posterior axillary line. An incision is then made through the posterior sheath of periosteum. If the parietal pleura is found to be of normal thinness empyema in that region is excluded. The two layers of the pleura are then sutured to gether with the intercostal bundle as high as possible under the ninth rib thus excluding the pleural cavity above from the costo phrenic sinus. If there is urgent indication for immediate drain age exploratory aspiration for pus is then performed, and when it is located an incision is made alongside the needle into it. If the patient is in relatively good condition it is safer to aspirate for pus and drain after allowing a few days for adhesions to form between the pleura along the suture line. If pus is aspirated through the free pleural cavity, empyema may result.

If the parietal pleura is found to be definitely thickened on incising the posterior periosteum, it may be assumed that the pleural cavity is walled off by adhesions, and exploratory locali zation of pus and drainage is instituted at once.

The location of the empyema anteriorly in this case is of relatively rare occurrence in my experience. It was probably due to old adhesions of the lung posteriorly. Had the search for fluid been abandoned after three negative aspirations in the region of the maximal dulness posteriorly and laterally the pa-

tient would doubtless have succumbed to the empyema. The relative lack of dulness anteriorly was due to the presence of air with the fluid.

**Summary**—A case of Hodgkin's disease with splenomegaly but without definite glandular enlargement is reported. Submental glands enlarged two months after splenectomy. The patient improved markedly after the splenectomy, the erythrocyte count increasing to over 4,000,000 and the hemoglobin to 65 per cent within a week after operation. A subphrenic abscess developed which was of a flat lenticular type and lay very high, and was therefore mistaken for empyema, and the pleural cavity was infected in an attempt to drain it before its true nature was recognized. The resulting empyema cavity lay anteriorly and the physical signs of it were obscured by a partial pneumothorax. The patient made a complete recovery as respecting the splenectomy subphrenic abscess and empyema. The case is illustrative of the value of the close method of treating an empyema cavity in the case of a critically ill patient. Had an open operation been done the patient probably would have succumbed, as his respiration was very rapid and labored at the time of the operation. Splenectomy would have been advisable in my opinion even had the diagnosis of Hodgkin's disease been made preoperatively but the ultimate prognosis in Hodgkin's disease, as is well known, is bad.

## SARCOMA OF FOURTH RIB (RIGHT); EXCISION BY THREE-STAGE OPERATION. X-RAY TREATMENT

MR L M, Augustana Hospital, No 88,546, a school boy of fifteen years, was first seen in consultation with Dr Anders Frick on February 5, 1926. He complained of a tumor just above and lateral to the right nipple which he had noticed five weeks previously and which occasionally gave him some pain.

His present illness dated from about nine months before this, at which time he had begun to notice an occasional dull aching pain in the region in which the tumor later appeared. This pain was not severe enough to interfere with any of his activities, was not worse on breathing, and had no relation to movements of his arm. About five weeks before the consultation he noticed a small nodule just above and to the outside of the right nipple, seemingly attached to the rib. It was not painful or tender. It increased steadily and rapidly in size. About two weeks after he noticed it, after a day in which he had taken an unusual amount of exercise, he was awakened suddenly at night by a very severe stabbing pain in the region of the swelling.

There were no subsequent attacks and when he was seen he had had no pain for several days. At no time had he had to curtail his activity, which included both basketball and hockey. He had lost only a little weight. There was no history of trauma to the affected region. His family and past histories were essentially negative.

The physical examination showed a well developed but not very well nourished rather pale boy. Temperature  $99\text{ }4^\circ\text{ F}$ , pulse 88, respiration 20. The positive findings other than the local condition were a moderate symmetric enlargement of the thyroid gland, a slight tremor of the hands, and a blowing systolic murmur heard best at the cardiac apex, but transmitted all over the precordium.

*Local Findings*—Just above the right nipple in the region of the fourth rib there was a hard sausage shaped tumor of the

chest wall about 4 cm. in transverse diameter raised about 1 to  $1\frac{1}{2}$  cm above the surrounding ribs and extending backward around the chest in the line of the ribs as far as one could reach under the scapula. It was firmly attached to the deep structures. There was no discoloration of the skin which moved freely over it. Hemoglobin 75 per cent., red blood-corpuscles 4,200,000, white blood-corpuscles 10,700.

He entered the hospital for operation on February 7, 1926, and was operated upon the following day.



Fig 284.—Sarcoma of fourth rib Roentgenogram of chest taken February 2, 1926, before the operations.

The x-ray picture taken at this time is shown in Fig. 284.

*Operative Notes* (February 8, 1926)—Excision of tumor of fourth rib, first stage Novocain and nerve-block anesthesia.

Curved incision from over second rib just to right of sternum downward to just below nipple, and then outward transversely to the midaxillary line. Flap of skin and pectoral muscles dissected upward and outward, exposing the tumor of the fourth rib and showing correspondingly portions of the third and fifth

ribs. The fourth rib from the costochondral junction backward was entirely displaced by a large sausage-shaped tumor about 8 cm. in diameter occupying both adjacent intercostal spaces and pressing upon both adjacent ribs. The tumor extended further back than could be determined with this exposure—well past the axillary border of the scapula. The hard tumor was mottled, reddish purple and nodular, and on being



Fig. 285.—Sarcoma of fourth rib. Roentgenogram of chest taken March 30th, five weeks after excision of the growth.

cut into for removal of a specimen for diagnosis bled freely. It extended about 3 cm above the level of the adjacent ribs. The third and fifth ribs were resected subperiosteally from the costochondral junction backward beyond the posterior axillary line. The fourth rib was cut across at the sternochondral junction and the lung sutured to the chest wall by a running stitch, after the manner of Roux, through the intercostal bundles corresponding to the resected ribs and around the anterior end of

the tumor. Because it was impossible to reach the posterior limit of the growth through this incision it was decided to perform a three stage operation at the second stage going in paravertebrally and mobilizing that end of the tumor. The wound was

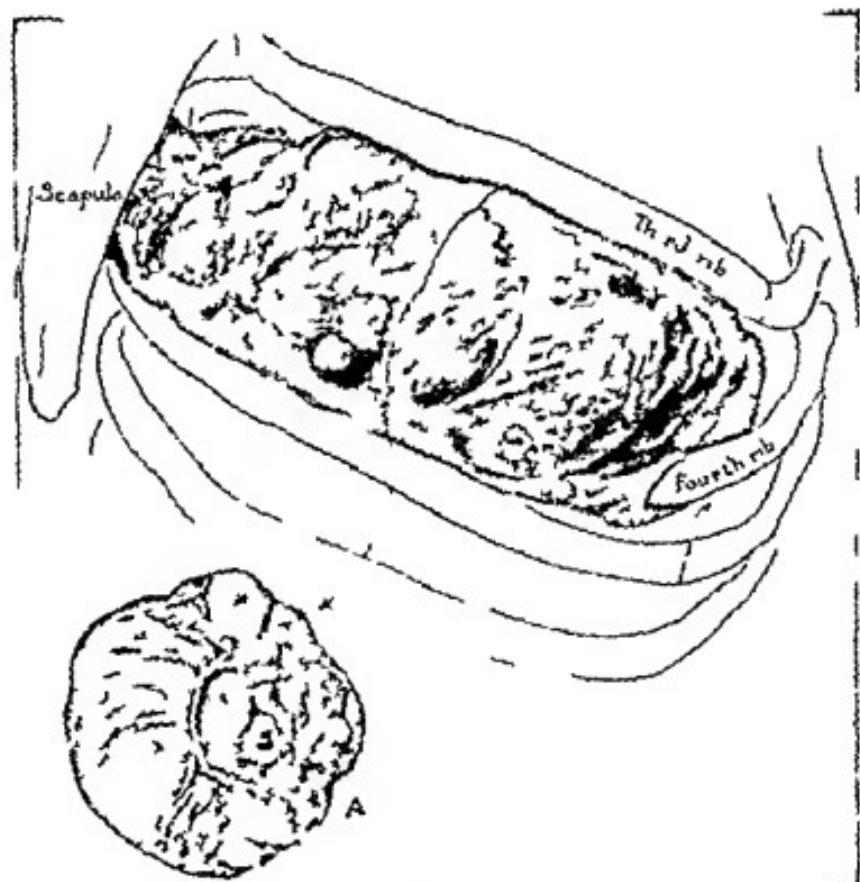


Fig. 286.—Sarcoma of rib. Drawing from gross specimen removed at operation

closed in layers with plain catgut to the muscle and dermal to the skin. No drainage.

*Postoperative Course.*—The patient stood the operation well and made a rapid recovery. A small amount of serous fluid accumulated in his pleural cavity but not enough to warrant aspiration. At the end of a week his temperature having been

normal for several days, the second stage of the operation was performed

*Operative Note* (February 15, 1926) —Novocain infiltration anesthesia. Paravertebral incision between the spine and the vertebral border of the scapula over the third, fourth, and fifth ribs. The incision was carried down through the muscles and the ribs exposed. The remaining posterior segments of the third

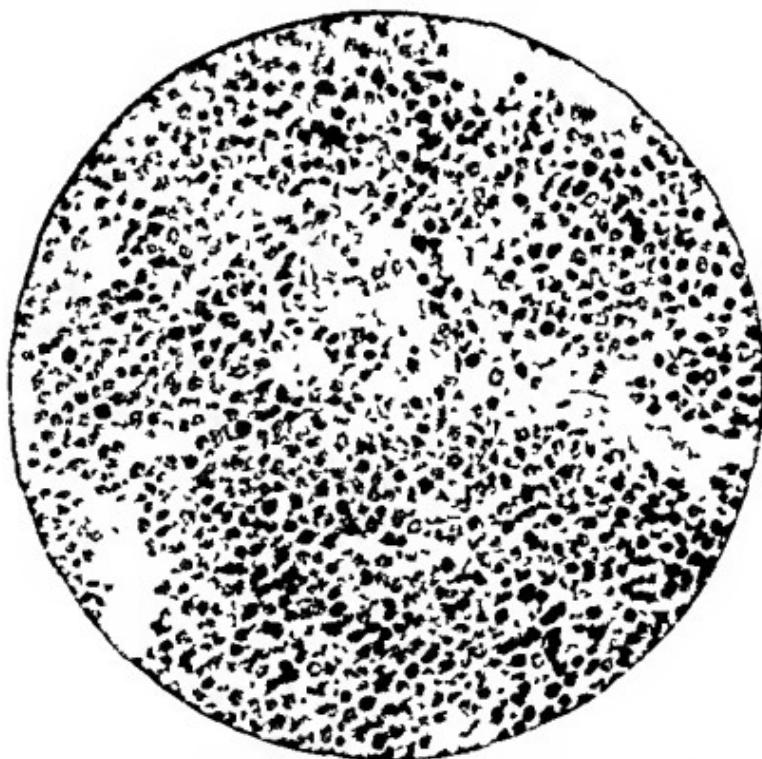


Fig 287.—Sarcoma of rib. Photomicrograph of typical section. Magnification 300 diameters.

and fifth ribs were resected subperiosteally and a segment of the fourth rib from the transverse process to within about 2 cm of the posterior limit of the tumor was similarly removed. The lung was sutured to the chest wall here as it had been anteriorly at the other operation. This completed the mobilization of the growth and walled it off from the free pleural cavity. The wound was closed in layers with continuous plain catgut to the muscles and fascia and dermal to the skin.

The patient had less reaction to this operation than to the first one, and at the end of a week was ready for the final stage.

*Operative Note* (February 22, 1926).—Novocain and nitrous oxide and oxygen anesthesia

Incision through the partially healed wound of the first operation. The muscle flap was turned back and the anterior part

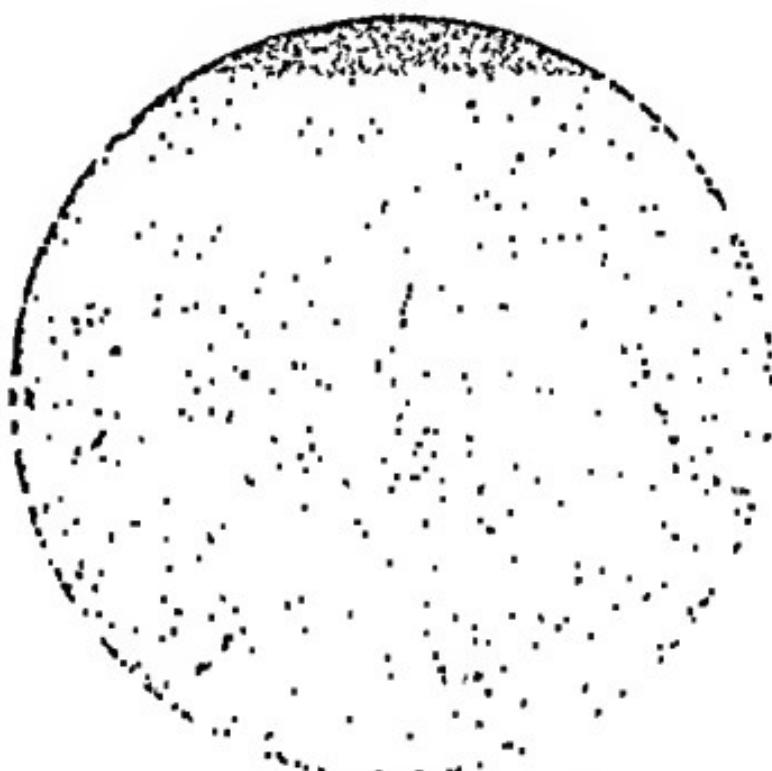


Fig. 286.—Sarcoma of tib. Photomicrograph of typical section Low mag. magnification

of the tumor again exposed. This was easily mobilized and the whole removed by cutting through the periosteal beds and the muscles and pleura around it. The pectoral muscle flap was sewn firmly over the operative area and the wound closed without drainage. Before the superficial tissues were sutured a small amount of air that had been aspirated into the pleural cavity was drawn out with a syringe.

The  $\alpha$  ray picture taken since the removal of the tumor is shown in Fig 285

The specimen was examined by Dr Jaffé, who made a diagnosis of sarcoma of the rib (Figs 286, 287)

*Progress Since the Operation*—The patient made a good recovery from the operation, had an uneventful postoperative course, and was sent home at the end of about two weeks. Since then he has been seen frequently, as he returned for  $\alpha$  ray treatment under the direction of Dr Henry Schmitz. He feels well, looks better, and has gained 7 pounds in the four weeks since his discharge.



## ACTIVE PROGRESSIVE PULMONARY TUBERCULOSIS WITH MARKED PROSTRATION COLLAPSE OF LUNG BY EXTRAPLEURAL RESECTION OF FULL LENGTH OF FIRST TO ELEVENTH RIBS IN EIGHT STAGES MARKED IMMEDIATE IMPROVEMENT

M B T a married American pharmacist of twenty eight, entered the State of Wisconsin General Hospital on June 22, 1925 complaining of a productive cough of loss of weight and strength, and of hemoptysis and night sweats His symptoms had been present for about eighteen months

His family history was negative He had had the usual childhood diseases influenza and pneumonia in April, 1918, and influenza again with frontal sinusitis in December, 1918 He did not fully recover from this until March 1918 In 1922 he had a chronic cough which lasted about four months, but at this time he did not feel sick and kept at his work

**Present Illness**—His present illness dated from April, 1924, at which time he developed pleurisy pains in his right chest a productive cough night sweats anorexia and loss of weight and strength His condition grew steadily worse and in September 1924 a diagnosis of pulmonary tuberculosis was made He was sent to a sanatorium where he remained a few weeks but without improvement He was coughing a good deal, losing weight running an evening fever and having night sweats From that time (December 1924) until his entrance to the hospital in June 1925 he had been in bed at home He was unable to take even the slightest exercise without an elevation of temperature and pulse He had lost 60 pounds in weight

**Physical Examination**—The patient was anemic emaciated, and looked sick The temperature varied from 99° to 100° F and his pulse between 90 and 110 His voice had the hoarse quality, and laryngoscopic examination showed the changes characteristic of laryngeal involvement There was limitation

of respiratory excursion of the right side. The right lung showed signs of cavitation just above the angle of the scapula posteriorly and at the base. There were moist inspiratory rales throughout the region of the right lower lobe. There were signs of fibrosis at the right apex but nothing indicative of activity. In the left axilla there were a few moist inspiratory rales but no other signs save those of compensatory emphysema.

He was raising about 3 to 4 ounces of sputum a day containing tubercle bacilli.

Vital capacity 1400 to 1700 c.c. or about 40 per cent of normal.

The urine showed a slight trace of albumin but was otherwise negative.

Blood hemoglobin 70 per cent red blood cells 4 960 000 white blood cells 14 000

Roentgenogram showed parenchymal changes in the right lung beginning at the first interspace and increasing in density to partial consolidation near the base with a large cavity posteriorly at the level of the sixth rib. There were parenchymal changes in the left lower lobe fifth interspace anteriorly with accentuated peribronchial markings above.

A diagnosis was made of active progressive pulmonary tuberculosis of the right lower lobe with cavitation and with slight involvement on the left and with early laryngeal involvement.

Pneumothorax collapse was attempted but could not be carried out on account of adhesions. A right phrenico-exaresis was then performed on July 17 1925 which resulted in complete paralysis of the right diaphragm and considerable elevation of it and consequent compression of the diseased lower lobe. The patient stood this operation well and showed some improvement enough to encourage us to attempt a thoracoplasty in spite of his poor condition and relatively unfavorable type of disease process.

On July 31 1925 the thoracoplasty was commenced. By the time that the posterior segments of the tenth and eleventh ribs had been stripped of their periosteum the patient's blood

pressure had fallen to below 90 mm of mercury and his pulse had risen to above 160. The operation consequently was stopped and the wound closed. Throughout the afternoon and evening he remained in a precarious condition his systolic blood pressure falling as low as 70. The next day he seemed better but was still very weak and running a rapid pulse and high temperature.

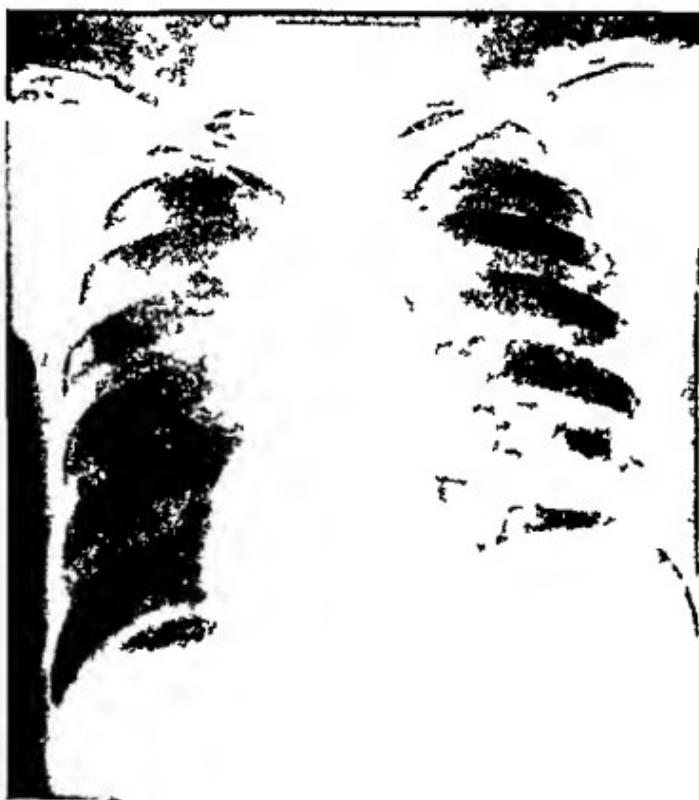


Fig 290.—Advanced active pulmonary tuberculosis x Ray of chest taken June 1925 several weeks before the first operation

One week later the wound was reopened and 8 cm segments of the two ribs from which the periosteum had been separated were removed. There was a sharp fall in blood pressure at the operation and postoperative elevation of pulse and temperature however, with return to its former level in forty eight hours.

Three weeks later, one month after his first operation, 8 cm posterior segments of the eighth and ninth ribs were freed of

their periosteum, and four days later were removed. He stood both procedures well, his pulse rising considerably, but his blood pressure maintaining its level much better than at the first operation.

On September 17th two weeks later, 6 cm segments of the sixth and seventh ribs were resected. Because the thoraco-plasty was being carried out over so long a period of time the



Fig. 291.—Advanced active pulmonary tuberculosis. X Ray of chest taken in December 1925 after phrenectomy and resection of posterior segments of the first to eleventh ribs. Note the elevation of the diaphragm with obliteration of the lowest cavity and also the relatively incomplete collapse of the chest wall against the lung.

periosteal beds were cauterized with silver nitrate in an attempt to prevent regeneration and so favor a good collapse. He stood the operation very well. There was a slight infection in the wound and on this account the next step was delayed for six weeks until November 3d at which time 6 cm segments of the fourth and fifth ribs were removed and the third was freed of its periosteum.

On November 25th segments of the first three ribs were removed.

During the course of these operations his general condition had been improving steadily. His temperature and pulse had fallen to within normal limits, his sputum had decreased in amount, and between operations he was able to be up and about the ward without elevation of pulse or temperature.



Fig 292—Advanced active pulmonary tuberculosis x-Ray taken in March, 1926, after completion of collapse by resection of the remaining segments of the second to the eleventh ribs.

Owing to regeneration of the ribs during the long intervals between the multiple stages the degree of collapse of the lung accomplished by the resection of the posterior segments of the first to the eleventh ribs, as outlined above, while considerable, was much less than after the ordinary two- or three-stage operation (Fig 291). It was evident that more would have to be done if he was to receive the benefit of the usual amount of collapse. Consequently, during the months of January and February, 1926 three operations were performed, and the remaining seg-

ments of the second to eleventh ribs being resected through a mid axillary incision. He stood the operations exceptionally well, and although at two of them three ribs were resected and at the other four, his reaction to them was much less than to the first operation when all that was done was the freeing of the periosteum from two ribs.

The collapse secured is shown in Fig. 292.



Fig. 293.—Advanced active pulmonary tuberculosis. Photograph of patient taken in March 1926 showing his present condition after completion of thoracoplasty. Note the absence of deformity.

His cough and sputum had practically disappeared before the last stage operation. During the course of the operations he gained several pounds in weight. His subjective improvement was marked and he was able to be up and about without a rise in temperature, which he had not been able to do in the duration of his disease before the operations.

**Discussion**—This patient is an example of what may be accomplished by multiple stage thoracoplasty in active progressive essentially unilateral pulmonary tuberculosis which has so re-

duced the vitality of the patient that the operative risk following the so called "standard" one- or two-stage operation would be absolutely prohibitive. This patient would surely have died promptly following such an operation, and there was no reason to expect that his condition would improve following further expectant treatment. The course of the disease was progressively downward.



Fig 294.—Advanced active pulmonary tuberculosis. Photograph of patient taken in March, 1926, after completion of thoracoplasty, showing the intercostal and axillary incisions.

The case further exemplifies what a complete collapse may be achieved by a complete graded costatectomy if the typical posterior thoracoplasty fails to bring about a sufficient degree of collapse.

The pulmonary collapse in this case has produced a remarkable improvement in the whole clinical picture which promises well for a permanent arrest of the disease.



## CLINIC OF DR HUGH MCKENNA

ST JOSEPH'S HOSPITAL

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### KOHLER'S DISEASE

THE patient, M R, aged seventeen, a stenographer complained of pain in the right foot for several years. The pain was most severe at the base of the second toe. She received treatments for one year without relief. A month before admission the right leg from the knee down began to ache. She had a varied line of treatment consisting of medication, special foot padding supports, and plaster of Paris cast for two months. For one month she had electric treatment. I especially call attention to the fact that this patient has received immobilization treatment by means of a plaster cast over a period of two months, since most of the literature I have had access to reports that a large percentage of these cases will be entirely relieved by this form of treatment.

In view of the fact that she was not relieved by this treatment, I asked Dr Philip Lewin to see her in consultation. Operation was then decided upon.

The operation, on February 9, 1926, consisted in cutting down and dissecting out the enlarged distal end of the second metatarsal bone, the outer half of which was loose and soft with some granulations on the joint surface. The head of the second metatarsal bone was resected. The cartilage of the apposing phalanges was not disturbed, and we, therefore believe that this will form a movable joint. Lane technic was used throughout. The crepitus felt before operation disappeared after removal of the bone. The pathologic report by Dr L E Hines is as follows:

'The distal centimeter of the second metatarsal bone including the whole of the articular surface constituted the gross

specimen. The outline of the dorsal half is irregular of the plantar half regular. The dorsal third of the articular surface is soft and movable. There is a crater like depression containing reddish granulations. There is a deep crevice 1 1 cm long extending from the crater forward and medial.

Microscopic. The base of the crater like depression is scar like fibrous tissue. There is no cellular inflammatory reaction or tumor formation.

Pathologic Diagnosis. Partial detachment of articular cartilage of second metatarsal bone (fracture?) (a) fibrosis of cartilage.

A Gottheb of Los Angeles in 1923 in the California and Western Medicine reported a case of Kohler's disease under the title of Osteochondritis of the Second Metatarsal Phalangeal Joint. He said that this joint was the one usually involved though not infrequently the third metatarsal bone may be involved. He showed that this condition occurred usually between the ages of thirteen and nineteen and that adolescence is a predisposing factor and that chronic trauma is probably also an etiologic factor. The microscopic findings as reported in Gottheb's article from such men as Kohler, Axhausen and Francino and from his own operative specimens appeared grossly like a tuberculosis the sequestra in places resembling granulation tissue. There was one area of granulation tissue surrounding necrotic bone but the granulations were free of leukocytes, giant cells and bacteria. The same specimen presented a villous hyperplasia of the synovial membrane. Gottheb reports that he has not seen any case in which the second and third metatarsals were involved in the same patient nor has he seen any cases in which the diseased condition was bilateral.

Donald A Murray in Northwest Medicine for 1924 describes Kohler's disease in the navicular bone and in reading over the very excellent description reported by Murray one is impressed with the fact that this condition is analogous to that found in the second metatarsal bone as reported elsewhere in the literature. The pathology and etiology factors are the same as in the metatarsal disease.

Fred E. Diemer and Frank E. Butler, of Portland, in a recent number of Radiology, believe the etiology is due to a form of violence rather than to a diathesis. They explain the etiologic factor of injury on the basis of the anatomic location of the scaphoid bone.

Our patient made an uneventful recovery. The wound healed in the ordinary time. The foot was kept in a plaster-of-Paris cast for two months. The patient had no pain, and, aside from some



Fig 295.

swelling that would naturally follow removal of the cast, her recovery was complete.

In examining the skiagram before operation and the specimen removed grossly one is struck with the rather normal appearance of the cartilage. If you examine the skiagram carefully I believe you will, as I did, make a diagnosis of some form of osteomyelitis. This was the diagnosis I made before opera-



Fig. 296

tion with the possibility of finding a small sequestrum. This was not the case. The external portion of the cartilage was



Fig. 297



Fig. 298

soft and flexible and give one the idea of an epiphysis in which the bone had been absorbed from this portion of the head. On the joint surface was a depression which is described in the microscopic report, in which there was some adhesions. I am describing this in some detail because of the rather striking resemblance to an osteomyelitis with sequestrum, which was not found at operation. In making the examination before operation and in manipulating the joint one got an effect of crepitus from either a broken bone or a roughened synovial surface. This, of course, was absent following operation.



## INTUSSUSCEPTION

W P, aged five years entered the hospital April 5, 1926, with a history of intussusception. The child was taken ill in the morning of this day and was seen by a physician, a relative of the family, who gave me the following history.

The patient otherwise well, was seized with a sudden pain in the lower right abdomen. Within a few hours after the onset of the attack he passed a slight amount of blood by the bowel and also vomited. On examination the physician found a distinct mass in the right lower portion of the abdomen and immediately made a diagnosis of intussusception and sent the child to the hospital.

I am reporting this case in the first place because I operated on this boy at the age of fourteen months for an intussusception. The symptoms described is classical of intussusception. The child was seen by a pediatrician before I was called. All the consultants agreed that operation should be performed immediately. The mother opposed operation and I therefore recommended fluoroscopic examination while a barium enema was being given, following the suggestion of Dr L L McArthur with the idea that the diagnosis would be made conclusive and that possibly it might help to reduce the intussusception.

Following the giving of the barium enema the child went on to a complete recovery without operation and is today entirely well. Unfortunately the fluoroscopic examination was not made during the barium enema and therefore we cannot say definitely that their was an intussusception although clinically the symptoms were classical for a diagnosis of intussusception.

Dr L L McArthur has on several occasions suggested to me the advisability of giving a barium enema and making a fluoroscopic examination in cases of intussusception on the theory that it will not delay operation and may reduce the intussusception, and it was because of his suggestion that I employed this procedure in this patient.

I have no doubt but that this was a case of intussusception and particularly in view of the fact that the child had had a previous attack. It is well known that intussusception may recur in the first six or seven years of life and there is no absolute way of securing the small intestine to prevent its recurrence. I have been particularly interested in the subject of intussusception in view of the fact that my oldest son at the age of fourteen months developed a very extensive intussusception and was operated on by the late J B Murphy. The intussusciens passed from the ileocecal valve through the colon to the hepatic flexure. The diagnosis was made by Dr P S Chancellor and the child operated on four hours after the onset of symptoms. He is now fourteen years old and has had no recurrence of the symptoms.

## EMPYEMA

In view of the fact that there has been so much discussion on the subject of empyema since the World War, especially regarding the relative merits of the open operation with rib resection (costectomy), extensive thoracotomy, and the so called "closed" method, I wish to present 2 cases, one treated by the open method of costotomy and the other by the closed method, in which a catheter was inserted through a small thoracotomy opening

The first patient, M. O., aged fourteen years entered the hospital March 18, 1926 with the classical symptoms of empyema—pain in the left side, frequent painful respiration cough, and chills and fever of eleven days' duration. Eleven days before the child had a chill followed by high fever, shortness of breath, and pain in the left chest. The temperature while above normal constantly, did not exceed 101° F. Under the care of a physician and nurse at home no improvement followed and the child was brought to the hospital.

Physical examination on entrance showed the boy to be acutely ill, with a frequent short cough, asthmatic in character, marked dyspnea, and fever. The respiratory excursion was greater on the right than the left side. There was absolute dulness over the entire left chest, beginning about the level of the third dorsal spine in the sitting posture. The right chest was hyperresonant. The breath sounds were vesicular in character, somewhat distant, and could be heard distinctly. There were no rales or friction rubs. In the recumbent position the dyspnea was marked and respiration lagged markedly on the left side. The left thorax bulged laterally and was hyperresonant from the clavicle to the second rib, and from there on impairment of breathing to absolute dulness at the base. There was absolute flatness in the midaxillary line. The level of cardiac dulness could not be obtained, the right dulness was about 14½

cm from the midline. The pulse was equal on both sides and varied from 110 to 120. There were no abdominal findings except a slight distention.

The chest was aspirated at the sixth interspace and approximately 200 c.c. of very thick greenish yellow pus removed. A radiograph was then taken (Fig. 299). The patient was removed



Fig. 299.—Radiogram taken March 19, 1926. The left chest is obliterated accompanied by some displacement of the heart to the right which is apparently due to fluid. The diaphragm on the left is obliterated. The right diaphragm is normal. There is some thickening involving the right hilus probably due to compression. (X Ray report by Dr. E. L. Jenkinson.)

to the operating room and a thoracotomy performed under local anesthesia 1 per cent novocain until the pleura was reached and then the addition of nitrous oxide gas. A catheter was inserted and secured with a safety pin and adhesive tape.

A second radiograph (Fig. 300) shows the change that has

taken place in the pleural cavity and lung after operation by the closed plan. Note that the pus has been evacuated without forming an appreciable pneumothorax.



Fig. 300.—Radiogram taken April 12, 1926. There is a catheter inserted into the lower half of the left pleural sac, the catheter extends upward to the level of the ninth rib posteriorly. The right diaphragm is normal. The left diaphragm is indistinct. There is a good deal of thickening involving the lower lobe on the left side, probably due to an unresolved pneumonia. There is no evidence of free fluid in either pleural sac (x Ray report by Dr E L Jenkinson.)

The second patient, F. B., aged four, was admitted to the hospital March 23, 1926, with a history of cough, pain in the left chest, chill, and fever of two days' duration. The patient was referred by Dr Charles Schott. The trouble began as an upper

respiratory infection about one week before the onset of the symptoms above mentioned

Examination on admission showed bronchial vesicular breathing, dulness in the left lower lobe, but no rales or friction rub. The heart was negative. Radiographic examination (Fig 301) showed the presence of an empyema.



Fig 301.—The left chest shows some bulging. The heart shows a slight displacement to the right. The left diaphragm cannot be outlined. The entire left lung is practically obliterated which apparently is due to fluid which has caused some compression of the left lung. The fluid seems to be quite well walled off probably due to adhesions. The right diaphragm is normal. The interlobar pleura on the right is thickened. The right lung shows a great deal of thickening near the spine which extends upward along the vertebral trunks (x Ray report by Dr E L Jenkinson)

On April 5th Dr Schott, having previously made a thoracentesis and drawn out a few cubic centimeters of thick white pus, called me in consultation, and I advised an open thoracotomy and the introduction of a catheter. At operation, to my surprise

I was unable to find pus after going well into the pleural cavity. We were then of the opinion that that was either an intralobar empyema or an encysted empyema, and decided to leave the catheter in until the next day in the hope that the pus might work into the free pleural cavity and in this way be taken care



Fig 302.—Radiogram taken five days later. The left lung is partially collapsed, this is especially true of the lower part of the upper and the entire lower lobe. The heart is displaced to the right. The left diaphragm is indistinct. The right diaphragm is normal. There is no evidence of free fluid in either pleural sac. The eighth rib on the left side, posteriorly, has been resected. There is a tube inserted into the left pleural sac, the tube is pointing upward and inward and is in contact with the collapsed lung (x-Ray report by Dr E L Jenkinson)

of. The next morning there was no sign of pus. The catheter was withdrawn and another radiograph made (Fig. 302).

On April 8th a second thoracentesis was made in which a much larger amount of pus was obtained. It was decided to do a costectomy. On the same day under general anesthesia I



## CLINIC OF DR. PHILIP H. KREUSCHER

MERCY HOSPITAL

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### OSTEOARTHRITIS, TRAUMATIC, OF THE ELBOW-JOINT (A SPECIAL VARIETY—BASEBALL PITCHER'S ELBOW)

TRAUMATIC inflammatory processes in the elbow, as in any other joint may originate from without or within. In the hinge joints which lie exposed, as the elbow, the external trauma plays a very much more important rôle than does the same trauma in the deeply seated and protected ball and socket joints. A blow upon the olecranon may bring about an acute process which is incapacitating, but is usually transitory, and in the absence of fracture usually heals with rest and immobilization. The trauma caused by excessive persistent and forceful sliding or grinding action of one cartilaginous surface upon another may bring about changes in the synovial, the cartilaginous, and even in the osseous elements which do not yield quickly to ordinary methods of treatment. This type of arthritis of internal origin is most often seen in persons following industrial or athletic pursuits, especially the professional tennis or baseball player. The "salary arm" of the baseball pitchers offers an example of repeated trauma and its harmful consequences as seen in no other line of activity.

In the elbow the trochlear of the humerus is received into the greater sigmoid cavity (olecranon) of the ulna and admits of the movements of this joint, namely, flexion and extension. The lesser head of the humerus articulates with the cup shaped depression on the head of the radius while the circumference of the head of the radius articulates with the lesser sigmoid cavity of the ulna allowing of the rotation of the radius on the ulna. Thus we see how in this rather complicated mechanism there are many instances of contact where trauma may be applied.

Following the reasoning of Ashoff we know that under special conditions the adaptability of a normal joint may be overtaxed through certain external or internal influences. In contrast to the natural or adequate vital stimuli which maintain the integrity of the joint we are confronted by unnatural or inadequate vital stimuli which cause cartilage and bone changes or disease. The predisposing etiologic factors in this special type of osteoarthritis may be enumerated as:

1 The natural ability of the patient to hyperextend the elbow joint, as was present in 2 of my cases. This hyperextension may be advantageous to the baseball pitcher in that it enables him to negotiate certain deceptive movements of the ball as it is thrown but it permits of unusual trauma to the component parts of the joints.

2 Excessive exercise of a joint in the early or practice season at a time when the cartilaginous surfaces are unaccustomed to such violent trauma.

3 The congenital absence of an adequate amount of chemical elements which if present might prevent destruction of the cartilage and bone.

4 Insufficient synovial lubrication in the joints of certain individuals.

The immediate cause of this type of arthritis is, of course, the unusually persistent forcible application of cartilage to cartilage. There is a terrific friction of the surface of the olecranon against the humerus, of the tips of the olecranon as it is forced into the olecranon fossa, and the circumference of the radius as it is quickly and forcibly twisted upon its ulnar articulation. When one considers that the professional athlete thus uses his elbow joint in throwing or hurling a round ball, 9 inches in circumference weighing 5 ounces a distance of 60.5 feet and that this exercise is repeated with great force from two hundred to three hundred times each day over a period of seven months each year it is not astonishing that finally the insults committed wear out or break down the articulating cartilage.

The pathology of early traumatic arthritis is not unlike that

of a low-grade degenerative type of arthritis deformans in its initial stages. The continued forcible exercise causes an injection of the synovial membrane and cartilage surfaces and consequently a serous effusion. If this force is continued there begins a roughening of the surfaces and a hemorrhage into the joint together with a tissue reaction or edema of the capsules and surrounding structure. The joint is swollen and painful.



Fig. 303.—Shows exostoses which brought about partial locking of the joint

If rest is instituted at this time the traumatic inflammatory changes soon subside, but if the trauma is continued the degeneration or destruction progresses. There occurs a definite fibrillation and softening with erosion of the surface cartilage with villous degeneration of the edge of the synovial membrane, as I saw it at the operation upon Case I. The change does not always seem uniform through the joint, but some irregularity of bone

and cartilage takes place often with erosion in one place and compensating overgrowth in another, as seen at operation in Case II. The cartilage cells undergo proliferation, burst their capsules and at the points of greatest trauma the matrix undergoes fibrillation. In my operated cases I saw evidence of the hypertrophic or proliferative type of osteoarthritis. There seemed to be in both cases a combination of both varieties. Cartilage de-



Fig. 304.—Same as Fig. 303 after operation.

struction was combined with cartilage and bone formation, resulting clinically, in a partial fixation of the joint, especially the absence of complete extension of the elbow and, pathologically, growths of small pieces of bone resembling small osteophytes completely enveloped by cartilage. These fibrous projections containing bone centers were firmly attached to one another and extended peripherally from the tip of the olecranon.

r the end of the coronoid process They were arranged in serial order not unlike an arrangement of a number of flattened beads or buttons placed side by side, being larger near their osseous attachment, but getting gradually smaller toward the end of the projection. It would seem that by a definite nipping process extending over a long period of years these small bits of cartilage and bony elements had been nipped off and then moved distally to make room for a new piece, but all being held together by firm fibrocartilage (Fig. 302). In addition, there was present in these 2 cases a marked thickening of the periosteum or cartilage lining the olecranon and coronoid depressions, which brought

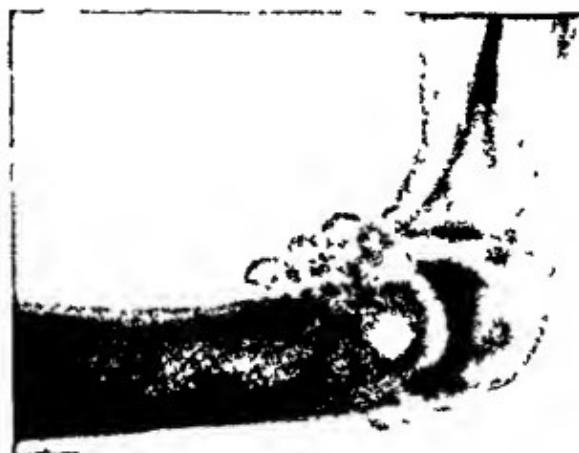


Fig. 305.—Lateral view showing osteophytes in grape-like arrangement locking the joint

about even greater limitation of motion than was apparent from the skiagram.

In the third case, a more advanced arthritis (Fig. 305), we see the same serial formation of larger osteophytes, but when viewed anteroposteriorly (Fig. 306) there is quite a different peripheral arrangement around the circumference of the olecranon process. Being thus placed, the bone formations interfere with free supination and pronation as well as with extension. There is increased perichondrial activity with peri-articular thickening. From the picture it would seem that these bodies were lying loose in the joint, but we have every reason to believe

that here, as in the previous cases they are connected one to the other by firm fibrocartilage. The limitation of motion is great and there is no intermitting locking, nor does the position of the various bodies change when observed under the fluoroscope. From the history it is evident that this proliferation has been going on for a number of years.

In the fourth case (Figs. 307, 308) we have a very definite involvement of the bone ends. The joint is greatly disorganized with great limitation of motion. There are numerous peripheral exostoses or osteophytes. These exostoses extend upon the



Fig. 306.—Anteroposterior view of the same case

shift of the bones at the points of muscular attachments. This patient has long since ceased his athletic activities, but even during the course of his ordinary daily duties as a butcher he is forced to completely rest his arm for several days at a time.

The diagnosis of this lesion is not difficult when one has the history of repeated definite trauma over a period of years in a non articular case when there has been no evidence of suppuration. The absence of a temperature increase above the normal, the absence of leukocytosis, and the non existence of a focus of infection all aid in the differential diagnosis. Blood and spinal

fluid Wassermann tests rule out lues. The skiagram shows the pathologic changes clearly. One of my cases diagnosed his own case before my examination and before an x-ray examination had been made. He stated that when he had an "ordinary" painful arm, which means a mild transitory traumatic involvement of the elbow-joint or traumatic myositis, it would always



Fig. 307.—Lateral view of Case IV showing osteophytes which almost completely fix the joint, not arranged in bead like formation as in previous cases

improve and even get well with exercise, but when the change came in the joint surfaces continued exercise finally forced him to discontinue.

My first case came for treatment after ten years of athletic activity as a baseball pitcher and three years after the first symptoms of elbow involvement. In the parlance of baseball he

hurls a "curved ball" and occasionally a slow or "fade away ball." The former is executed by forceful extension and supination action, while the latter is thrown with extension and pronator action of the forearm. The same methods were used by Case III.



Fig. 308.—Anteroposterior view of the same case showing the degeneration of the joint and osseous changes especially on lower end of humerus.

The patient designated as my second case, is a man aged forty, who has pitched ball since he was eleven years of age. He complained of serious pain in his elbow only during the last two years. He as well as the fourth case used what is known as the moist or spit ball which for the most part is thrown with overhead or side arm forcible extension motion and a sudden snap.

produced by violent contraction of the muscles of the forearm. The fourth case alone has been forced to retire from athletics while the third case has discontinued his activities as a thrower or pitcher except on rare occasions but continues as a member of his athletic team in another capacity.

The first and second cases were operated. The osteochondral projections were removed and the usual occupation was resumed after six and seven weeks respectively (Fig. 304, Case II). The third and fourth have not been operated but contemplate arthrotomy in the near future.

The management depends upon the existing degree of traumatic arthritis.

In the *first* or *early stage* a complete rest of the elbow with or without external fixation is indicated. Hydrotherapy, counter irritation by means of topical applications and diathermy are valuable adjuncts in the treatment. The work is resumed gradually and without attempts at extraordinary activity.

The *second stage* that of cartilage and bone changes requires more radical treatment. If the patient wishes to continue at his occupation a removal of the osteochondral projections is necessary. Rest and partial or complete fixation of the joint over a period of weeks is necessary. It is my belief that the patient at this time should be advised to seek another occupation or profession if he wishes to retain the integrity of the elbow joint.

When the *third stage*, that of true traumatic osteoarthritis, has been reached a change of work is imperative. Even here, as in my fourth case it is questionable if a man can perform any strenuous manual labor at any occupation without arthrotomy or partial arthroplasty.

Because of excessive willingness to work, of eagerness to succeed or to acquire fame for athletic prowess, or because of gross ignorance a patient will often destroy the integrity of a useful joint, whereas if he had been wisely warned or advised by his surgeon he might have used his skill and strength to great advantage in some other line of activity.



CLINIC OF DR GOLDER L McWHORTER

OAK FOREST INFIRMARY HOSPITAL

OLD POTT'S FRACTURE WITH EVERSION DEFORMITY.  
PERSISTENCE OF OPEN WOUND INTO THE JOINT.  
CORRECTION BY AUTHOR'S OPERATIVE TECHNIC.  
RECOVERY

THE diagnosis of this case, J V , which I am presenting to you, was, deformity with eversion and posterior displacement of the foot following Pott's fracture of six weeks' duration, overriding of the fractured fibula and persistence of an open wound into the ankle-joint This man is thirty nine years old Forty five days before I operated upon him for this condition he slipped and fell down stairs while he was moving a piano He fell four or five steps upon his left foot, which caught under him with the foot inverted, he thinks His weight and some of the weight of the piano fell upon this foot There was a deep cut over the medial side of the ankle which in all probability was done by the pushing through of the medial malleolus of the tibia

He was taken to one of the large hospitals, where a posterior molded cast was placed upon his leg and foot Two days later, because of the unsatisfactory condition of the fractured bones, he was put under an anesthetic and the leg manipulated again followed by re-application of a molded plaster cast over the back and the outside of the leg This was left on until the patient came here, due to economic conditions I first saw him about two weeks before I operated, which was about a month after the injury His past history was negative He denied any venereal disease For some time he had worked as a piano mover Before that he had worked as a laborer and had always been well

Physical examination (Fig. 309) showed a well developed and muscular man with no complaint apart from the leg. There was a wound gaping widely just below the medial malleolus of the left ankle, which extended transversely for about 1 inch. The edges were somewhat irregular and the wound was filled with protruding granulation tissue. The deltoid ligament was completely torn across. There was a moderate amount of thin seropurulent discharge but no evidence of a septic condition of the ankle joint which opened into the wound. The foot was dis-



Fig. 309.—Eversion deformity following Pott's fracture with persistent wound into the joint. Injury one month before this picture.

placed laterally with marked eversion. There was an angulation just above the level of the ankle joint on the fibula due to a fracture at this point. On attempted reduction of the deformity the foot seemed fixed, apparently due to the union of the fractured overriding ends of the fibula.

Roentgenograms at this time (Fig. 310) showed an oblique fracture of the fibula which extended from the joint line on the medial side upward and outward for about 1 inch. There was

very marked displacement of the astragalus and foot laterally for about 2 cm, so that only one-half of the joint surface was in contact with the tibia. There was marked eversion due to overriding of the fragments of the fibula. There was no visible bone fragment broken off from the tip of the medial malleolus. On lateral view there was some posterior displacement of the foot,



Fig. 310.—Roentgenogram showing marked eversion with lateral displacement of the astragalus and foot

which included the lower fragment of the fibula. There was also some equinus deformity of the foot.

Since there was no mobility of the fragments, it seemed advisable to wait for another week or two to see if it was not possible to get healing of the wound. However, with careful dressings

there seemed to be no tendency for healing which I considered to be due to the separation of the edges of the wound to the continuous discharge from the joint synovia and partly to chronic inflammation. No manipulation except the correction of the lateral displacement by refracturing the fibula would permit the skin edges to approximate each other.

Greater delay would produce further unfavorable changes in the joint and soft parts with perhaps the development of a serious infection. Therefore I decided to operate correct the deformity and at the time repair the open local wound.

**Operation Forty five Days After the Injury**—The original wound just below the medial malleolus was partially filled with granulation tissue. I excised the edges and then extended the incision upward at either end of the wound making a U-flap (Fig. 311 insert). The deltoid ligament was found to be torn completely across. I dissected the skin flap up together with the subcutaneous tissues exposing the bone. I pushed aside the soft parts with a periosteotome from the malleolus and by everting the foot and refracturing the fibula delivered the end of the tibia through the opening.

In order to thoroughly examine the ankle joint and remove, if necessary, granulation tissue in the joint or any callus which might prevent close approximation of the fibula to the tibia I carried the foot outward in complete eversion until it came in contact with the side of the leg with the sole lying upside down. The joint surface of the astragalus faced downward and it as well as the lower end or joint surface of the tibia was entirely exposed for inspection (Fig. 311). The refractured ends of the fibula could also easily be seen.

The medial half of the joint surface of the tibia which had not been in contact with the astragalus due to the lateral displacement, was covered with a velvet like granulation tissue. This granulation tissue was easily wiped away leaving the cartilage apparently intact beneath it. There was some callus formation removed from between the tibia and fibula. The foot was then brought back and put into a varus or overcorrected position and held at right angles to the leg. The torn deltoid

ligament was sutured with interrupted chromic catgut sutures as well as possible. The freshened wound edges were sutured with a few silkworm-gut sutures, leaving some space between



Fig 311.—Insert at upper left corner shows inverted U-flap incision over the medial malleolus. The foot is shown completely everted after resection of the fibula. Exposure of the joint is complete. Granulation tissue has covered the part of the joint surface of the tibia up to the line of contact of the displaced astragalus.

for drainage. A plaster cast was put on the leg extending above the knee with the knee held at right angles which relaxed the dorsal muscles of the leg and permitted more dorsal flexion of the foot. This position often accomplishes a result otherwise only obtained by a tenotomy of the tendo achillis.

**Postoperative Course** — The cast was split down both sides in order to remove the dorsal part for dressings. There was

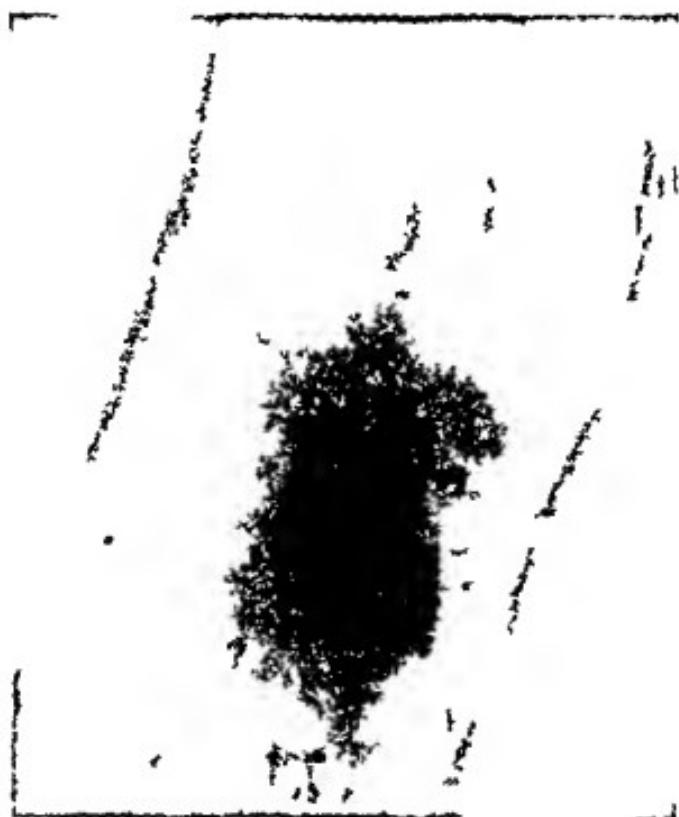


Fig. 312.—Roentgenogram after correction taken through the cast.

some swelling after the operation which lasted for about a week but there was no evidence at any time of any sepsis of the joint. The wound drained rather freely for a few days. The wound over the fibula healed by primary union. There was a local necrosis of the edges of the skin where it was sutured directly over the malleolus but there was no acute infection. Some motion in the ankle was obtained to a limited extent during dressings.

About three weeks later this split cast was removed and a circular cast was applied below the knee. A small opening was cut over the medial malleolus for dressings. Roentgenograms after the operation (Fig. 312) showed the foot in inversion and the deformity apparently corrected. The patient at this time (Fig. 313) still has a small area of chronic granulation tissue in a part of the wound just over the medial malleolus.



Fig. 313.—Photograph following operative correction of the deformity. The foot is held in an overcorrected varus position.

#### DISCUSSION

Pott's fracture as defined by Scudder<sup>1</sup> is understood to be the injury caused by forcible eversion and abduction of the foot upon the leg. Fracture of the lower end of the fibula is constantly present. When the force is applied indirectly to the fibula by eversion of the foot, there is abduction with a rupture of the tibiofibular interosseous ligament. This is followed by a fracture of the fibula usually about 2 or 3 inches above the tip of the malleolus. The lateral displacement produces a tear of the internal deltoid ligament of the ankle, or, if it holds, the tip of the

internal malleolus is pulled off. If the force is still continued the lower end of the tibia or the internal malleolus is pushed through the skin. The probability is that many of the tendon sheaths and especially those that cover the posterior tibial tendon are torn along with other injuries to the soft parts.

When the force is applied directly against the lateral side of the ankle the fracture of the fibula is more likely to occur at the level of the ankle joint, although the fracture is usually oblique. Posterior displacement of the foot is important because it is the result of more extensive injury, but the causes must be understood in order to correct it along with the eversion deformity.

Speed<sup>2</sup> says that a backward displacement of the astragalus can only occur when the external malleolus is freed entirely from its contact with the lower end of the tibia. If the interosseous ligament remains intact and the malleolus is broken off below it there will be no posterior displacement although there may be extreme eversion of the foot. There may be posterior displacement. Speed states with freeing of the external malleolus in the following conditions. A fracture very low down on the external malleolus which allows the lower fragment with its attached strong ligaments to slip backward a condition of diastasis of the tibiofibular junction with laceration of its ligament, a fracture of the fibula high up with its line extending down into the tibiotalar joint a fracture of the posterior lip of the tibia with separation of the tibiofibular ligament which pulls off a piece of the tibia rather than tears through the ligament, or with lesions of the two lateral ligaments or malleoli when the foot carries backward both malleoli.

There are many complications with a Pott's fracture which occur according to Speed in about 15 per cent of hospital cases. The early corrective treatment is important. This case was complicated by an open wound. Scudder says that in every open Pott's fracture the wound should be enlarged and cleaned, but he advises conservative and expectant treatment. In this case the indications for operation were the deformity, the time element and the gaping soft parts. The open wound was

discharging a small amount of synovial fluid from the ankle joint and, together with the separation of the soft parts, healing was delayed. It was evident that further delay before operating would only make it more difficult to correct the deformity and perhaps result in destruction of the articular cartilages with loss of the important lateral as well as the anteroposterior motion in the joint. However, one cannot always judge of the benignity of wound infections by the appearance of the discharge and lack of acute inflammation. Carrel and Dehelly<sup>3</sup> from their war experience, have demonstrated streptococci in old wounds with no more reaction than in this. One should obtain a bacteriologic report, if possible, before operating on such wounds. We know that streptococci remain in the tissues longer than most other pyogenic organisms, and where there is a history of such an infection secondary operations should be delayed. However, surgical judgment must depend upon many factors. In this case it seemed advisable to correct the deformity, at the same time attempting to close the wound.

The technic of correction of this vicious union was planned largely because of the open wound. A large exposure of the ankle joint is indicated in these cases in order to inspect the region of the tibiofibular articulation and remove any callus present, to correct any marginal fracture or other deformity present, to inspect or restore accurately the joint surface, and to remove any bone fragments or granulation tissue.

A wide exposure of the joint in old Pott's fractures is emphasized, especially by Charles Parker,<sup>4</sup> who obtains an adequate one by means of the Kocher incision. The Kocher<sup>5</sup> incision is a curved lateral one behind the external malleolus. It extends upward on the leg and also forward on the foot to the peroneus tertius tendon. The saphenous nerve and vein are preserved. The sheaths of the peroneus longus and brevis are split up and the tendons are divided and later sutured. The joint is opened subperiosteally from below, the external lateral ligaments are cut, and the capsule of the joint is detached along the edge of the astragalus. The foot is forcibly dislocated inward and over the internal malleolus, so that the upper surface of the astragalus

looks downward Kocher devised this technic for resection of the ankle joint.

My technic would probably not be so desirable as his for resection of the ankle joint if there were an absence of a deformity resulting from a fracture of the lower end of the fibula. A surgical fracture of the lower end of the fibula would not be necessary in a resection for tuberculosis, but it is absolutely necessary in the correction of eversion of the foot following an old Pott's fracture. It is evident that the technic which I have used gives just as good exposure as the Kocher technic. This approach also possesses the advantage of not having to cut any tendons. In the Kocher technic it is necessary to cut the two peroneal tendons while in the method which I have used it is not necessary to cut any tendons.

Leveuf<sup>6</sup> uses a curved incision over the lateral side of the foot with the flap turning from in front of the malleolus backward in order to expose the tibiofibular articulation in an old Pott's deformity. He refractures the fibula and pulls the lower fragment downward, but makes no effort to forcibly displace the foot as in the Kocher method.

In experimenting with my method upon the cadaver I have found it necessary to split open the sheath of the posterior tibial tendon in order to displace it posteriorly below the tibia. This was not necessary on my patient, but it was probably because the sheath was torn at the time of the injury. In the absence of an open wound as in my case, it may be unnecessary to make an incision over the fibula for drainage.

In the postoperative treatment one should attempt to get some mobilization in the ankles as soon as possible after the operation. In this case during removal of the dorsal splint for dressings we were able to get some dorsal flexion. Judet<sup>7</sup> has emphasized the danger of too early walking as an important cause of secondary eversion of the foot. One must delay weight bearing he states, for at least sixty days in all cases, while in serious cases where there has been considerable valgus and diastasis displacement, one should wait three months.

I believe that this would be a good case a little later for

using Delbet's<sup>8</sup> molded lateral splints of plaster of Paris which permit weight bearing with anteroposterior motion. It is impossible to apply them at the present time on account of the small granulating wound over the medial malleolus.

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## MULTIPLE DEFORMITIES FOLLOWING OLD FRACTURE OF BOTH TIBIA AND FIBULA NEAR THE ANKLE. OPERATIVE CORRECTION WITH USE OF PARHAM BANDS. DISCUSSION OF THE USE OF FOREIGN MATERIAL IN OSTEOSYNTHESIS

This patient, L S, aged thirty two has come back at our request. He had an unreduced deformity of the leg following a long oblique fracture of the lower end of the shaft of the tibia and the fibula. This resulted from a fall down the steps of his home from the second floor. He thinks that he fell with his left foot turned in. There was immediate complete disability and he was taken to a nearby hospital. At that time they put posterior and lateral plaster splints on his leg. He was in the hospital one month when he was discharged with instructions to use the leg. The patient went home and tried to walk, but could not bear any weight on his foot due to severe pains in the ankle. He entered the hospital here because of complete persisting disability two months after the injury.

Physical examination showed a well nourished male. There was inability to bear any weight on his left leg. A very marked deformity of three types could be seen (Fig 314). There was a rotation of the foot and lower fragment of the tibia inward on the longitudinal axis of about 40 degrees. There was angulation of both bones at the site of the fractures with outward bowing. The angulation of the fibula was so acute that it appeared to be pushing through the skin. Shortening of the leg was noticeable. On measurement it was 6 cm shorter than the right. The ankle and lower leg were markedly broadened and enlarged. The calf and knee were about normal in size.

The roentgenograms of this case (Figs 315 316) are very interesting and it should be noted that the rotation deformity cannot easily be determined from them. A long oblique fracture of the lower end of the tibia may be seen. The long pointed

fragment of the upper end was detached from the anterior face of the tibia. The foot was rotated inward so that the fragment in overriding the lower one apparently tore through the tibiofibular ligament and became impacted at the level of the joint. This upper fragment acted as a wedge in first passing through the interosseous ligament and then forcing the fragment of the fibula acutely outward. There was also anterior angulation with overriding of both tibia and fibula.



Fig. 314.—Internal rotation deformity is very marked; angulation and shortening are also present.

The indications for operation were multiple. The extensive rotation deformity alone would interfere with useful function. The overriding with shortening of 6 cm was not of itself so definite an indication for refracturing such an old injury. However, the overriding in this case had resulted in a wedging of the upper sharp fragment into the joint space and I believe that it was this wedge-like pressure between the bones and into the joint which produced the severe pain on attempted weight bearing. The angulation deformity was of the varus type and it would not be suffi-

cient in itself to justify an open operation on this two months' old fracture. This case illustrates fairly well the necessity of depending not entirely on the roentgenograms but more especially on careful examination and surgical judgment to determine the resulting position of a fractured bone. The position obtained by his first medical attendants was evidently



Fig. 315.—There is overriding of the tibia, so that the upper one is wedged into the ankle joint, forcing the fibula out.



Fig. 316.—Posterior angulation is present, but the amount of rotation of the foot cannot be determined from the roentgenograms

thought sufficient from the roentgenograms taken there to give him a good functioning leg

In attempting to correct the various deformities I felt that a Parham band would be more efficient in holding the ends of the long oblique fracture together and it would be easier to ap-

ply this close to the joint than a steel plate. The important job is to correct the deformity of the tibia free the ends correct the rotation and angulation deformities and then maintain the fragments in a position with as little shortening as possible. The fibula will as a rule unless the ends are separated by a ligament or muscle unite without any trouble and a slight angulation with thickening of the lower leg would produce no disability although it might be undesirable from a cosmetic standpoint.

**Operation (Two Months After the Injury)**—The skin incision extended from in front of the medial malleolus forward and upward for 3 or 4 inches on the leg and then posteriorly to the back of the tibia. This made an anterior flap which exposed almost the whole extent of the fracture. The upper long anterior bone fragment was displaced medially while the posterior fragment was displaced laterally and backward. The thickened periosteum and callus had partially ossified but it was possible with a chisel to separate the fragments. A small incision was made over the region of the fractured fibula and the union was broken apart. This did not free the lower end of the upper tibial fragment and considerable force was necessary. Upon freeing this fragment which was wedged in and ossified between the tibia and fibula the foot was felt to be free and suddenly rotated with a snap back into its normal axis. This could have been done under an anesthetic I think at the time of the injury making an open operation unnecessary.

It was believed that this freed the entire lower end of the upper fragment from between the tibia and fibula. Some callus was removed from between the ankle bones but it was thought wise not to do any more than absolutely necessary. When the fragments snapped back in place the long end of the upper fragment fitted with some traction on the foot against the oblique old fractured surface of the lower fragment. This seemed to correct the shortening of the leg. Later it was seen in the roentgenogram that the tip of the upper fragment had broken off between the tibia and fibula. It is doubtful if any further attempt to lengthen the leg would have been successful at this time.

While maintaining extension on the foot two Parham bands

were introduced about the fragments and tightened so that the oblique fragments were actually forced together into their normal position. The soft tissues were carefully sutured together over the bands and the skin was closed. A small soft-rubber drain was put in at the upper angle of the wound some distance from the metal bands. The fibula ends were felt to be markedly straightened, and the skin incision over them was sutured.



Fig. 317.—The fractured surfaces of the oblique fragments of the tibia have been pressed together by the powerful force of the tightened Parham bands.

The foot was placed at right angles to the leg and, although there was some limitation of motion, it was thought advisable to wait before attempting more manipulation. The foot was put up in a cast extending to the knee which was split open for dressings. Roentgenogram (Fig. 317) and a lateral view follow-

ing operation show good apposition of the fragments. The upper Parham band might have obliterated a persistent slight separation at the upper junction of the fragments if it had been placed higher up. This results in a slight posterior bowing of the leg which is not enough to be noticeable. There is still a small tip broken off from the upper fragment wedged in between the tibia and fibula. This has ossified with some of the old callus and there will probably always be a widened ankle.



Fig. 318.—Photograph taken one month after discharge from hospital. Function of the leg and ankle are excellent.

**Postoperative Course**—The wound healed by primary union, and the cast was removed in six weeks. Following its removal there was limited motion in the ankle. Twice a week for the next six weeks I forcibly flexed and extended the foot, putting it completely through its motions only once each time. The first few times I could feel a breaking up of adhesions probably where the upper fragment had penetrated into the joint capsule. Following these manipulations motion was improved. The patient was discharged walking very well four and one-half months after operation and was feeling able to do some work.

He has returned at this time for examination one month after leaving the hospital (Fig 318). During the past month he has asked his employers to put him back to work but they have requested him to wait a little longer. There is now excellent function of the leg and ankle. On measurement there is 15 cm of shortening of the leg. There is good motion in the ankle and the patient has no complaints.

#### DISCUSSION

It may be advisable to speak of others' experience with the Parham and other metal bands in order to warn against their injudicious and indiscriminate use. Leveuf speaking from his own experience and from Delbet's Clinic in Paris states that he has seen annular necrosis beneath these bands once in the tibia and several times in the bones of the forearm. He warns against circular plates especially in the forearm. It may hold the fragments well for a time but as a result of a disturbance of circulation in the bone necrosis and secondary displacement may occur. He states that there may be delayed callus formation or a secondary fracture at the level of the band. Because of his experience he advises removing them when consolidation has occurred. However, the tissues may tolerate a large amount of metal in plates with screws. Occasionally they may produce pain, chronic inflammation or fistula, and require removal. The use of the circular metal bands in oblique fractures is much more efficient than a plate. Alglave has devised a combination screw plate together with circular bands.

In some experimental work with fractures on dogs I have obtained in numerous instances a failure of callus to form over a circular linen thread. This has made me feel that a circular band of any sort should be avoided if possible, but particularly in the locations where we frequently obtain non union. It has been my policy to avoid a metal plate or a foreign body of any sort, such as beef bone or ivory, wherever possible. In a non union an autogenous bone insert should be used. Where an open operation is necessary for an unsatisfactory fracture result or deformity I try to get accurate approximation without using

plates or bands. Carefully applied plaster splints or bandages will often maintain accurate position. With the use of the fluoroscope and numerous roentgenograms I think this practice may be more generally adopted following operative correction.

## OLD POTT'S FRACTURE WITH POSTERIOR DISLOCATION OF THE FOOT AND LIPPING FRACTURE OF THE POS- TERIOR CONDYLE OF THE TIBIA. COMPLETE DIS- ABILITY. NUMEROUS DIFFICULTIES ENCOUNTERED IN OPEN OPERATION

THIS case which I am going to operate at this time is interesting because there is such a marked posterior dislocation of the foot following Pott's fracture. It is particularly instructive, since it illustrates another type of deformity which may result from an improperly or incompletely treated fracture of this type.

This patient is sixty-eight years old. Four and one-half months ago he fell on the icy sidewalk upon his left ankle. The foot was turned completely outward at right angles to the leg, he says, and states that he pulled the foot back into a straight line at that time. He was taken to a large hospital where the doctors set the leg and applied molded plaster splints to the leg and foot. Roentgenograms were taken at that time.

He was discharged from the hospital and since removal of the splints he has been unable to bear any weight on the leg because of pain. There is constant pain in the ankle, especially at night. The leg and foot swell up and become very blue, but this subsides somewhat at night. Otherwise the patient feels well and states that he has a good appetite. He says that the only serious illness that he can remember is an attack of jaundice in 1898 when he was sick for a week or two. He has had a rupture for sixteen years following lifting a heavy object. It has been getting somewhat larger.

Physical Examination.—This man is in good health and looks to be around sixty years. He is not feeble and states that he has always been quite active.

The laboratory examinations of the blood and urine are negative. On examining the left leg (Fig. 319) there are several things that may be easily seen. The foot is displaced in moder-

ate equinus and posteriorly upon the tibia. The lower end of the tibia may be seen projecting anteriorly and forming an abnormal prominence in front of the foot. There is some thickening due to callus over the medial malleolus and also along the lower end of the fibula but there is no apparent lateral deformity of the foot or leg. The foot and ankle have been definitely cyanotic and edematous but this has largely disappeared over night. There is still a boggy condition of the tissues about the



Fig. 319. Photograph before operation of four and one half months old Pot's fracture with unreduced posterior dislocation of the foot.

ankle joint but this is probably the result of the abnormal conditions there or may be partially a result of senile changes in the blood vessels.

There is no motion in the ankle joint and there is pain on attempted movement or pressure on the foot. The roentgenogram (Fig. 320) in the anteroposterior position shows no apparent deviation from the normal. There are several fracture lines about the medial malleolus but it is in good position. The

lower end of the fibula is thickened for about  $1\frac{1}{2}$  inches and there is a fracture line starting near the joint and running upward without lateral displacement. In the lateral view (Fig. 321) there is a very marked posterior and upward displacement of the foot. There is a large triangular fragment from the posterior



Fig. 320.—Anterior view which shows no apparent lateral deformity



Fig. 321.—In the lateral view there is a posterior dislocation of the foot. The posterior condyle of the tibia is fractured and the large triangular fragment is displaced with the astragulus. There is angulation with overriding of the fragments of the fractured fibula

condyle of the lower end of the tibia which has been completely separated and displaced backward and upward. This fragment includes about one fourth of the articular surface of the tibia. The astragulus has followed the displaced fragment and has been completely dislocated. There is a moderate amount of

shortening of the leg due to this displacement. The fibula is seen to be fractured and the upward and backward displacement have permitted some overriding of the fragments with anterior angulation, although there is no lateral deviation.

The indications for operation are obvious. The complete loss of function is due to the posterior dislocation of the foot with the lipping fracture. If this were a recent fracture the difficulties would be much less than they are after four and one-half months. During this time the fibula has united with over riding, there has been considerable healing of the ligaments and soft parts about the ankle. The muscles of the tendo achillis have shortened and the tendon probably must be lengthened before normal position may be obtained. The fibula must be re-fractured and lengthened with straightening, the fragment of the posterior tibial condyle must be freed from its callus and, if possible replaced and fastened. Fixation may be done by means of a screw put through from its posterior surface into the main shaft of the tibia after the bone fragment has been replaced and the foot corrected. The medial malleolus may be left undisturbed and it may be hoped that the internal deltoid ligament may retain enough strength to maintain function at this point. There does not appear to be any diastasis of the tibia and fibula. In choosing the method of operation one must remember the various things that must be done and plan the incision accordingly.

Algave has used the transcalcaneus route to correct this lipping fracture because of his desire to avoid cutting the tendo achillis. He removes the tuberosity of the calcaneus with its tendon intact by means of a Gigli saw, and elevates them in order to expose the fractured posterior condyle. He then re-attaches the calcaneus fragment with a screw to the body of the calcaneus (Leveuf).

In this case the displaced condylar fragment of the tibia is apparently large enough to fix in place with a screw, and since this will accurately hold it after reduction, I feel it is probably indicated. In the absence of correct alignment of the articular surface of the tibia there would be more or less prolonged disturbance of joint motion, which is very important in walking.

The incision is also very important, since one must obtain exposure and preserve the blood supply to the flap. Delbet and Picot have used a U flap over the back of the foot. However in a number of cases there has been a necrosis of a part of the skin flap. As a result Picot has adopted an L incision, the vertical line of which may be made near enough to the fibula to permit operative work upon it, as proposed by Alglave for the transcalcaneus route. The horizontal cut extends around the base of the tendon to near the opposite malleolus (Leveuf). The plan in this case will involve splitting and cutting the tendo achillis, exposure of the posterior fragment of the tibial condyle, freeing it and refracture of the fibula which will permit replacement of the dislocated foot. After the foot has been replaced the fibula fragments may be held in accurate position and the tibial fragments may be fixed. The tendo achillis must be lengthened and the split ends sutured together. In the other case of deformed Pott's fracture we have mentioned the several conditions necessary for a posterior dislocation of the foot to occur. Speed states that a backward dislocation may occur only when the external malleolus is freed entirely from its contact with the lower end of the tibia. It is therefore evident that the fibula must be refractured in all of these cases where there has been union of the fragments with the foot in posterior displacement.

Screws and bands or plates are used freely in the open operations on these cases by many surgeons. They place them in the tibial fragment, in the fibula, in the tibial malleolus and then put a long screw through the fibula holding it to the tibia. As I have stated before, it is my policy to avoid the use of any non absorbable material where position may be maintained by any other means. It is especially in maintaining accurate approximation of the articular surface of a joint that fixation by means of a screw or other non absorbable substance may be indicated. If proper alignment of the fragments by means of catgut sutures or fixation by suturing the adjacent soft parts can be maintained until external plaster splints may be applied it is preferable in the majority of cases to the use of foreign material.

**Operation**—An L incision is made from behind the lateral



little in order for the ends to fit accurately. The oblique ends now overlap, and by suturing the muscles and fascia together over them there is no tendency to displacement.

The skin-flap is now turned down, but due to the lowering of the heel and posterior part of the foot, in correcting the equinus the skin-flap does not come within an inch of covering the denuded area. This is a problem which had not occurred to me and which has not been mentioned by the originators of this technic. It is evident that I cannot draw the skin-flap down by tension, as there would surely be necrosis of the whole flap. It is also clear that I do not want the wound left open over the lower part because of the danger here of infection to the joint and tendon suture. The skin-flap cannot be swung laterally by an incision completing a U incision since that will not lower the flap any to cover this important part of the wound. Fortunately, I dissected rather deeply when I turned up the skin-flap, and it contains numerous blood-vessels coming down from above. Perhaps by cutting just through the skin transversely at the top of the incision it will be possible to preserve these subcutaneous vessels to help maintain the vitality of the flap. This apparently is working out satisfactorily; the vessels and their adjacent soft parts are freed by undercutting from the skin and stretch out almost an inch. This permits the skin-flap to swing downward and it is now possible to suture it completely and accurately around the base and the side of the L incision. There is quite a gap left at the top of the wound, but there is muscle beneath it, and it is to be hoped that this area will be walled off from the deeper parts and will granulate without secondary infection. Considerable padding is now placed over the wound and the foot is held in a slightly dorsiflexed and varus position while a plaster cast is put on. This will be cut out for dressings.

Roentgenograms will be taken, so that improvements in the position may be made later if desired. This is an extensive operation with several very undesirable factors, especially the danger of necrosis and inadequate closure of the skin-flap.

The necessity of lengthening the tendon in neglected cases

of this sort make an incision over it desirable unless one chooses to do merely a tenotomy. It seems where the fragment must be fixed that it should be possible to do so by a lateral Kocher incision displacing the foot over the medial malleolus where this does not need to be disturbed. In cases where the medial malleolus must be refractured the technic which I describe, using a medial incision, separating the malleolus and turning the foot completely outward might be more satisfactory. This case illustrates the extreme importance of obtaining early and accurate reduction of a fracture. It also demonstrates the necessity of the surgeon's interpreting the roentgenograms himself to check up on his correction of multiple fractures or deformities which may not be familiar to the roentgenologist.

## CLINIC OF DR FREDERICK G DYAS

Cook County Hospital

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### HYPERTHYROIDISM IN CONNECTION WITH DIABETES

THE basis of this clinic is a series of 3 cases of exophthalmic goiter in conjunction with hyperglycemia and glycosuria. These 3 cases occurred in a series of 30 cases of exophthalmic goiter treated during a period of six months. The statistics from the Mayo Clinic several years ago showed only 9 cases of diabetes in a series of 1800 cases of exophthalmic goiter. This would point to an increasing incidence of the combination of diabetes and hyperthyroidism. Independently of the other each disease is on the increase, and both are caused to a large extent by modern methods of living. Eastman, in his masterful essay upon fatigue, says that the highly civilized races are going back physically. He reminds us that civilization always destroys the man who builds it, that many diseases are chiefly the by-product of our civilization. The change from the simple pastoral life of former times to the crowded high pressure routine of modern living is responsible for the rapid increase in many diseases. This applies chiefly to the degenerative conditions of the cardiovascular system hypertension, toxic goiter, diabetes and cancer.

In the goiter of hyperthyroidism the importance of mental strain worry, grief, and physical exhaustion must not be overlooked. The increased incidence of toxic goiter is the direct result of modern methods of living and is a commentary upon our twentieth century civilization. Crile's entertaining theory of the "kinetic drive" as a causative factor in the development of hyperthyroidism is well substantiated from a clinical standpoint.

The term "drive" has of late become a part of our every-day

conversation and the drive itself has become a part of our lives. It is a national disease. Few are exempt from it. The order of the day is speed and high pressure. Modern life yearly exacts a greater tribute in the form of outlay of nervous energy. This is the natural result of the undreamed of development of the mechanical arts chemistry and electricity. It is manifested in our social life and in the fine arts. The individual is overstimulated from infancy. The modern curricula in the grades, high school, and the university increase their burdens year by year, until only the inexperience and enthusiasm of youth could remain unappalled at the prospect. Leaving his alma mater, the individual is confronted with the unprecedented demands of modern living. The luxuries of yesterday have become the necessities of today. The high pressure of modern business life lays an almost unbearable burden upon the individual.

In her own sphere woman is subjected to the same stimulation as man. The problems of the home, the lessened control of children, the struggle for social position (in far too many instances unassisted by the solace of religion) increases the nervous tension of the weaker sex. The efforts of equal rights for women fanatics to put both sexes upon the same level as to clothing dressing the hair and the use of tobacco and alcohol have not lessened the burden for women.

What is the effect of this early and continued stimulation upon the individual? It has been demonstrated that under the influence of strong emotion excessive fatigue or a combination of both that certain organs take on an increased activity. It is probable that all the tissues in the body respond to this stimulation but the thyroid adrenals, and liver are especially sensitized to such activation. Under these conditions there is thrown into the circulation an increased amount of secretion from the thyroid and adrenals and of glycogen from the liver. The effect of this may be observed in the increased volume and frequency of the heart beat and pulse, the rapidity and depth of respiration, the increased moisture of the skin, the alertness of the mind as shown in the facial expression, and the activity of the skeletal muscles as manifested by purposeful movements or by trembling.

The sum total of this increased physiologic action is measured by the so called metabolic rate test

Hyperglycemia occurs in health after meals and exercise It occurs abnormally in diabetes, obesity, hemorrhage, asphyxia, and after the use of adrenalin, ether, chloroform or phenol

Hypoglycemia is found after overdosage with insulin, in exhaustion, as proved by the examination of the blood of marathon runners, in tetany and after the administration of sodium bicarbonate

In 1906 F Muller suggested that a special type of glycosuria is related to exophthalmic goiter, and that in the future the thyroid gland should be studied more carefully in its relation to diabetes In 1867 Dumontpalier, of Paris, read a paper entitled Exophthalmic Goiter and Glycosuria in the Same Patient Several papers followed this but no serious investigation into the relation of diabetes and exophthalmic goiter was made until 1909, when Sattler collected 56 reported cases In a majority of these cases diabetes developed after a preexisting goiter, although in a few the diabetes seemed to antedate the thyroid disease

Quoting from Lund and Richardson "One of the dangers of operation upon patients with exophthalmic goiter is the severe toxemic reaction (classic symptoms), nausea, vomiting, and frequently coma and death Since it has been shown that the hypoglycemia produced by insulin may cause a reaction proportionate to the degree of hypoglycemia if untreated by measures to restore the blood sugar, it becomes important to discover, as suggested by Holman, whether there is a hypoglycemic factor in the reaction following thyroidectomy There is a rise of blood sugar after thyroid operations similar to that of other patients seen in other postoperative conditions Postoperative conditions may produce an increased demand for glucose Treatment should maintain supply of glucose, as hypoglycemia may occur"

Sattler commented upon the hereditary influence and the frequency with which one or the other disease, i.e., hyperthyroidism or diabetes, occurred in various members of the same family

Non toxic thyroid disease does not affect glycosuria. Patients with exophthalmic goiter because of their high metabolic rate burn themselves up quickly if diabetes develops (Fitz). Fitz concludes from his study as follows:

1 Hyperthyroidism and diabetes occur together in a small number of cases.

2 The diabetes usually follows the thyroid disturbance but may precede it and tends to parallel in severity the severity of the thyroid intoxication.

3 There is no reason for believing that partial thyroidectomy alone has any curative effect on diabetes as patients with non toxic goiter operated upon showed no improvement of the diabetes.

4 Certain patients with toxic thyroid disease and diabetes improve to a considerable degree after the thyroid symptoms are checked. This probably occurs because of a change in the rate of metabolism.

The histories of the 3 cases to be presented today are as follows:

**Case I**—The patient a male thirty nine years old had noticed a progressively increasing state of irritability for three years with enlargement of the thyroid. There was also a fine tremor of the hands. In addition to these findings there was palpitation and intermittent heart beat slight precordial pain shortness of breath on slight exertion edema of ankles sweats and a loss of weight of 25 pounds in three months in spite of a ravenous appetite.

Examination of the neck revealed pulsation over the thyroid gland which was uniformly enlarged each one of the lobes being about the size of a lemon. A definite bruit could be heard over the gland. The urine showed 2 per cent sugar.

A diagnosis of exophthalmic goiter glycosuria and a relative mitral insufficiency was made. The basal metabolism was 90 per cent plus.

Rest ice bag digitalis Lugol's solution and the daily examination of the urine for sugar was the routine followed to

gether with a restricted diet. The patient became sugar free after seven days.

A typical thyroidectomy was done. The patient made an uneventful recovery and remained sugar free upon an unrestricted diet until leaving the hospital a period of thirty days.

**Case II**—The patient, a white male twenty seven years old, complained of fatigue on slight exertion, nervousness, and palpitation of the heart, which had been present for three months. There had been a loss of weight of 30 pounds in four months in spite of an excessive appetite.

Examination of the neck revealed a symmetric, soft, diffuse enlargement of the thyroid gland both lobes and isthmus. A palpable pulsation and a systolic bruit were heard over the gland. A fine tremor of the hands was present and excessive sweating of the palms. The urinalysis was negative for albumen, but contained 3 per cent sugar. The basal metabolism rate was 51 per cent plus. A diagnosis of early primary toxic goiter was made and the patient given Lugol's solution three times a day, together with rest digitalis, and the precordial ice bag. He was put upon a desugaring diet until his urine was sugar free—a period of ten days—after which a typical thyroidectomy was done.

Following the operation the patient was given Lugol's solution, sodium bromid, and an ice bag to the neck the latter being discontinued after two days. He made an uneventful recovery and the basal metabolism eleven days after operation was 11 per cent plus. He remained sugar free upon an unrestricted diet until he left the hospital at the end of three weeks.

**Case III**—The patient a white male, thirty two years old, complained of a progressive swelling of the neck, dizziness, and weakness of five months' duration, also nervousness, diarrhea, and a loss of 60 pounds in the last three months. Previous to the onset of these symptoms the patient was perfectly well. Dizziness and fainting spells compelled him to give up his position. His past history was negative except for slight nausea and some abdominal distress.

Upon examination the thyroid was found to be enlarged bi laterally right lobe larger than left and of firm consistency. No nodules were palpable except one small one on lower side of isthmus. There was no pulsation of the gland but a systolic bruit was heard over the gland. The rest of the examination was negative except for a slight tenderness over the colon and a fine tremor of the hands. Patient was very nervous and easily disturbed. The basal metabolism was 59 per cent plus. The urine contained 2 per cent sugar.

He was given Lugol's solution, digitalis, rest and the pre cordial ice bag and was put upon a desugaring diet. His condition did not change much and when taken to the surgical ward the diagnosis was confirmed but operation delayed on account of the presence of glycosuria. He was placed on a strict diet and after being sugar free for nine days he was operated upon.

At operation the right lobe was removed with difficulty as it was very friable and markedly adherent to the strap muscles. The left lobe was easily freed and removed without difficulty. Both lobes were found to contain many nodules. Malignancy of the right lobe was suspected but the pathologic report showed marked hyperplasia of the glandular elements having no tendency toward malignant appearance. A moderate amount of colloid was found in some of the acini but for the most part the glandular structures were close set and devoid of lumen. Here and there papillary projections were within the acini. A dense fibrous septa was found separating masses of glandular tissue and collections of round cells were interspersed everywhere. The microscopic diagnosis was benign hyperplasia of the thyroid gland.

Following the operation the patient made an uneventful recovery and remained sugar free upon an unrestricted diet during his stay in the hospital—a period of three weeks after operation.

These 3 cases presented a marked degree of strumitis which was not observed in a rather large series of cases of hyperthyroidism in which there was no hyperglycemia or glycosuria.

Bergstrand reports the discovery in 3 of 6 cases of diabetes

of distinct pathologic changes in the thyroid analogous to those found in exophthalmic goiter, but there were never any symptoms suggesting exophthalmic goiter. When diabetes and exophthalmic goiter are associated the exophthalmic goiter precedes the diabetes. In these cases the changes in the thyroid gland were in different stages of development in 3 cases. The thymus was not enlarged in any case. In 2 cases the diabetes developed during pregnancy.

C Legiardi-Laura states that sugar must be present in the blood in a definite amount in order that animal life may be preserved. Hyperglycemia is harmful, hypoglycemia is dangerous. The sympathetic endocrine chain probably provides the hormone which controls the pancreas, which represents the midway station in the metabolic route of glucose. The ultimate processes are the utilization of sugar by the muscles, the storing up of the surplus, and the burning up of the needed quantity in the process of oxidation. It is during all the intermediate stages of the metabolic processes that the sympathetic endocrine system plays its rôle. The ultimate phase is played by the tissue cells.

Recent work on the thyroid is important as pointing to the thyroid and pituitary as regulators of the supply of the pancreatic hormone to the blood. By thyroidectomy on partially depancreatized animals or by ligation of the thyroid arteries glycosuria disappears thus confirming the previous theory that the thyroid has an important influence on sugar metabolism.

Laura believes that the thyroid control of sugar metabolism is predominant in infancy and the pituitary in adult life. Either we admit that the pancreatic, thyroid, pituitary, adrenal glycosurias are all independent entities and we have as many forms of diabetes, or diabetes is a special disease due to a dysfunction of the pancreas and all the other endocrine members are either compensatory or regulatory organs. Laura formulates this general theory:

1 With a degenerated pancreas and a normal pituitary thyroid function we have diabetes.

2 With a normal pancreas and hyperfunction of the pituitary thyroid system we also have diabetes.

Pathology offers an explanation of the cause of diabetes, but not a solution of therapy. Admitting that spontaneous diabetes is caused constantly by a degeneration of the islands of Langerhans, we are compelled to revert to physiology for successful treatment. We must either substitute the destroyed part of the organ or stimulate, if possible the remaining healthy portion of it.

The transplantation of pancreas and the administration of pancreatic extracts including insulin represents the first solution. The counteracting of the thyroid and especially of the pituitary hyperfunction offers a second solution. In every case in which the metabolism of sugar is decreased but not destroyed the indication is for the stimulation of the remaining metabolizing capacity. In cases in which the metabolizing capacity for sugar is completely destroyed there is no means at present of restoring it.

Eppinger, Falta and Rudinger assert that thyroidectomy raises the tolerance of animals for test doses of glucose, prevents glycosuria from epinephrin and mitigates the effects of pancreatectomy.

Janney and Isaacson found that hypoglycemia was the rule in thyroidectomized dogs.

Boe found the same hyperglycemia from adrenalin injections in rabbits before and after thyroidectomy.

Dennis and Aub found fasting hyperglycemia in their cases of hyperthyroidism. An excessive rise of blood sugar after ingestion of 100 grams of glucose and 50 grams of bread was found in every case examined. No regular relation was demonstrable between hyperglycemia and glycosuria on the one hand, and the severity of the toxic condition on the other. Epinephrin caused a high and prolonged rise in blood sugar in hyperthyroid cases.

According to Plummer the injection of thyroxin in animals has produced toxic symptoms and increased metabolic rate. Genuine exophthalmic goiter has not been produced.

Sanger studied 8 cases of Graves' disease in which the metabolism rate was 30 per cent above normal. After a fast of

fourteen to sixteen hours each patient drank a glucose solution which generally represented 175 gram per kilogram of body weight. The characteristic hyperglycemic response of hyperthyroidism was present in all 7 of the severe cases and 6 showed glycosuria.

Morris found the glucose tolerance test of confirmative value in the diagnosis of mild or doubtful cases of hyperthyroidism. He found that the blood sugar rose higher than normal in the hyperthyroid cases.

Chvostok reported alimentary glycosuria in 60 per cent of his cases of Basedow's disease.

Fitz reported 39 cases of diabetes and hyperthyroidism. Cases with non toxic thyroid showed no improvement in the diabetes following thyroidectomy. Certain patients with toxic thyroid disease and diabetes improved considerably with respect to their diabetes after the removal of the thyroid. This benefit was believed to be explained by a reduction of the metabolic rate, acting similarly to a reduction of diet. According to the reports of a number of writers the administration of thyroid substance may not only cause glycosuria in normal persons and reduce the high rate of carbohydrate tolerance in hypothyroid patients, but may also stand in suspicious relationship with the onset of true diabetes.

As a result of a study of these 3 cases and a review of the literature we arrive at the following conclusions:

- 1 Diabetes and hyperthyroidism are on the increase.
- 2 Hyperglycemia and glycosuria should be considered not alone from the standpoint of pathology of the pancreas but also in relation to the ductless glands.
- 3 Since the medical treatment of hyperglycemia is diametrically opposed to that of hyperthyroidism it is necessary to dispose of hyperthyroidism surgically before proper dietetic treatment for hyperglycemia can be instituted in most cases.
- 4 The results thus far reported and in the cases here presented justify thyroidectomy in proper cases of hyperthyroidism with hyperglycemia and glycosuria.

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## ECHINOCOCCUS CYST OF THE LIVER

WHILE echinococcus cyst is a rare condition in this country, it is, nevertheless, encountered with sufficient frequency to necessitate familiarity with the signs and symptoms and pathology.

The diagnosis is not often made before exploratory laparotomy. The conditions with which it is most frequently confused are subphrenic abscess, solitary abscess of the liver and cyst of the pancreas, or an accumulation of pus or serum in the lesser peritoneal cavity. We shall operate on one case this morning and present the histories of two others.

**Case I**—The case for operation this morning is that of a man twenty nine years of age, who comes in complaining of pain in the stomach, vomiting, and constipation lasting over a period of fifteen days. In the last two months he has lost 30 pounds in weight. He states that he was quite well until fifteen days ago, when he was suddenly seized with pain in the epigastrum. This increased rapidly in severity, and in about ten minutes he vomited, which gave some relief, but the pain soon increased in severity. This sequence was repeated at intervals until admission. The pain localized in the epigastrum and was not referred downward or backward. He has vomited about fifty times since the onset, the vomitus being fairly large in amount at first, but lately less so and of various shades of yellow and green. Constipation has been almost complete since the onset except for one spontaneous movement. The tenderness was marked at the onset and he was unable to bear the weight of his shirt over the abdomen. This tenderness, however, has lessened in degree. About ten days after the onset he consulted a physician who made a diagnosis of ulcer of the stomach and prescribed a diet and some medication. Upon the last visit to the physician he was advised to go to the hospital because of the increasing severity of the symptoms.

His physical examination is without importance except that the epigastrium is markedly distended. Percussion elicits marked discomfort extending from the costal arch to the umbilicus. Liver dulness is present down to the costal arch. The rigidity and tenderness are marked over the whole epigastric area. The lower abdomen is flat and no rigidity or tenderness is present. The reflexes are normal.

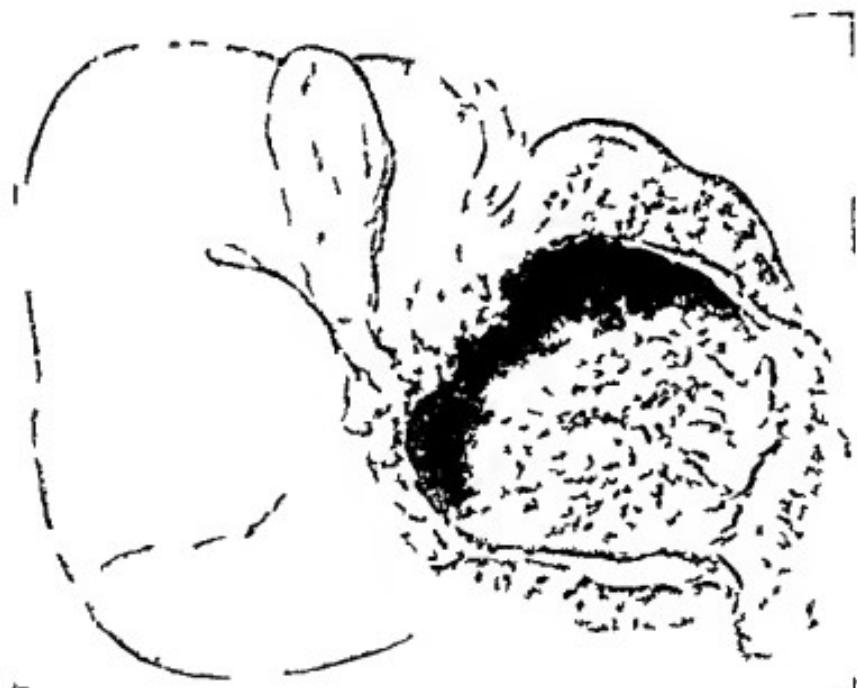


Fig 322.—Lower surface of liver showing large echinococcus cyst occupying practically the entire left lobe. Note remnants of adhesions.

He was sent in from the examining room with a diagnosis of acute dilatation of the stomach. A note is made that the patient has had vague ulcer history over a period of seven years with marked symptoms for the last fifteen days. In view of this history a second diagnosis of perforated ulcer of the stomach with a walled-off abscess above the liver constituting a subphrenic abscess was made. A third diagnosis was made of liver abscess starting in the midline and extending over to the left lobe of the liver.

The patient has been anesthetized with ether. I am making a midline incision. Opening the peritoneal cavity a smooth oval mass is seen to occupy a position above the stomach and apparently involves the left lobe of the liver. On puncturing this abscess a large amount of sour smelling milky white fluid containing small cysts escapes. It is evident from the findings that we are dealing with an echinococcus cyst of the liver. A drainage tube is carried down to the abscess cavity and another one inserted through the peritoneal cavity.

**After history**—The patient developed a general peritonitis and died seventy two hours after operation. Postmortem examination showed a typical echinococcus cyst of the liver with daughter cysts in the wall of the mother cyst (Fig. 322).

The interesting feature of this case was the similarity of the signs and symptoms to those of a ruptured gastric ulcer and the inability to make a diagnosis in the absence of an exploratory laparotomy.

**Case II**—The second patient a man of twenty eight years was admitted to the hospital with the examining room diagnosis of amebic abscess of the liver. He complained of pain in the epigastrium radiating to the back. The patient stated that for the past four months he has been having pain in the epigastrium which was quite severe for a few days then almost disappeared only to return in a week or two. He has never vomited. The bowels have been somewhat constipated—one stool in two days. His previous history is unimportant.

Physical examination shows a well developed male who does not seem acutely ill. Examination is negative except for tenderness in the region of the gall bladder. There is no rigidity in the flanks and no dulness. The reflexes are normal. Marked tenderness later developed in the right hypochondrium and on deep palpation a mass could be felt in the right lobe of the liver.

The patient states that two years ago in Buenos Aires Brazil a physician told him he had a cyst of the liver. Operation was refused. Because of the history of persistent constipation a second diagnosis of echinococcus cyst was made.

Here are the cases and you can judge the results for yourselves I have presented these cases before the Chicago Orthopedic Club some months ago. The first case is an extremely interesting one as the patient's condition was not recognized on account of complicating symptoms. Dr. Ralph C. Hamill will give you the neurologic aspect of the case while I will confine myself to the elucidation of its orthopedic aspect.

#### CASE I

J. P., male aged thirty-one married entered hospital on June 1, 1925. The following history was obtained:

**Present Complaint** — Pain in the back, duration one year; numbness of legs and feet, duration one week; unable to void urine seven days duration.

**Onset and Course** — Patient states that he had been feeling perfectly well up to about one year ago. Last June he had a bad cold and was sick for about two weeks. After he recovered from this illness he commenced to get sharp pain in the spine (lower thoracic region). At that time he went to a doctor who treated him for lumbago and the pain disappeared but a feeling of stiffness in the region of the back remained. Patient states that about February 26, 1925 he had an attack of severe pain in the back (lower thoracic region) and since then he had these attacks about every two weeks. Numbness in his legs is of one week's duration as was stated above and has increased since then so that the patient now has a paralysis of his legs. Patient states that about seven days ago he started to have difficulty in urination and this has increased in severity since the onset and now he is unable to void and has to be catheterized. For the past three months he has become constipated and must resort to cathartics. Urine examination shows a presence of blood corpuscles and a slight trace of albumin. Family history negative.

**Physical Examination** — Well nourished, well developed white male of about thirty-one years of age. He does not appear acutely ill but has considerable distress from distention of the bladder due to urinary retention. Further examination shows the following:

Lower extremities show very slight movements in the knees and hips, but none in the feet or toes. Power in the muscles of the thighs is good, but none in the muscles of the legs or feet. Sensibility is slightly diminished from the knees down and the position sense is abolished. Above the knees there is a marked hyperesthesia. Patellar reflexes are abolished. There is a marked ankle clonus present. There is a suggestion of a Babinski sign present on the right side. Examination of the spine shows that the normal lumbar lordosis is obliterated. The spine appears straight and rigid. At about the twelfth dorsal vertebra a slight prominence is present suggesting that of a gibbus. There is considerable muscle spasm present in the region of the lower back and an attempt of fixation in the middorsal region. There is some tenderness present in the region of the twelfth dorsal vertebra with a limitation to extension. On attempted passive extension of the back there is considerable pain elicited.

Diagnosis in this case is tuberculosis of the spine. Before orthopedic consultation was called a diagnosis of transverse myelitis was made. The myelitis, it was thought, was due to a septic absorption from extention and infection in the bladder. The first x-ray pictures taken in this case were interpreted incorrectly. After a physical examination of the back the diagnosis of tuberculosis of the spine (Pott's disease) could not be questioned (Fig. 323).

Comments—DR RALPH C HAMILL. There are two possibilities to be considered in Pott's disease one, an extension of the tuberculous process through the dura, and the other a compression mechanism due to collapse of a vertebral body which leads to distortion of the spinal cord. In this patient the vertebra at fault is practically at the lower end of the spinal cord. In other words, one would suspect that distortion due to gibbus formation is of lesser importance and extension through the dura of greater importance. However, such conclusions are more or less relative and not absolute. The fact of the matter is that the numbness increasing to paralysis indicates an involvement of the contents of the dural sac and the difficulty with micturition is in keeping with these findings. It is with diffi-

culty that one explains loss of knee jerks associated with ankle clonus. In fact, because each man is particular about his own specialty, this neurologist wonders if the knee jerks were absent or, as seems more probable that there was failure on the part of the patient to relax sufficiently to allow of an exposition of knee



Fig. 323—x Ray film of Case I showing diseased twelfth dorsal vertebra. The body of the vertebra is crushed and markedly decreased in the vertical diameter.

reflexes. In other words, tuberculosis of the spine is apt to cause a variety of reflex defense mechanisms and voluntary impulses going into the quadriceps femoris would interfere with reflex impulses, the voluntary impulses being a part of a general tenseness of muscles attempting to immobilize the affected parts.

The ankle-clonus is more understandable and suggests pressure above the lower lumbar and upper sacral segments. Such pressure interferes with normal pyramidal impulses and ankle-clonus appears when impulses passing down the pyramidal tract are interfered with. The Babinski sign also indicates interference with pyramidal tract function. The numbness and paralysis are to be accounted for upon somewhat the same basis, namely, pressure on the cord above the upper level of the numbness, namely, in the upper lumbar cord. Numbness is a subjective phenomenon, the objective side of which is the loss of the sense of position. These symptoms mean that pressure is exerted on the dorsal surface of the spinal cord and perhaps also upon the lateral surfaces. Such pressure interferes with impulses passing up the dorsal tracts which carry especially impulses of pressure sense. In the immediate neighborhood of the posterior tracts on either side are the pyramidal tract. Paralysis is caused when pressure upon these tracts is sufficient to shut off voluntary impulses passing down. The hyperesthesia is perhaps the best localizing symptom we have, in that it marks an irritation of either the incoming posterior routes or of the cord segments themselves. Such irritation might be due to either the inflammatory process or a deformity of the cord and its routes I say that it might be due to the inflammatory process, and by that I have in mind the collection of spinal fluid which probably is to be found above such a lesion as a tuberculosis of the spine when that lesion threatens to break through the dura. It is believed that above such an inflammatory focus there is a collection of spinal fluid of sufficient size and under sufficient pressure to cause interference with the normal function of the underlying nervous tissue.

**DR. BERNSTEIN:** The general physical handling of the patient is of great importance, since patients with Pott's disease suffer from a general loss of vitality, more so than those suffering from any other bone and joint tuberculosis. The local measures to be employed are also of the greatest importance. One must bear in mind that the crushing effect of superincumbent weight upon the diseased vertebrae and the irritating effect

of motion are two factors that are very injurious to the progress of the local process. The three most important points to be observed therefore in the treatment of Pott's disease are as Lovett states (1) The elimination of superincumbent weight (2) fixation of the diseased part of the spine (3) fixation in hyper extended position. Tuberculosis of the spine can be treated by one of three methods. First by placing the patient in a recumbent position preferably on the abdomen without permitting flexion or extension of the spine. The patients are to remain in this position until a bone block is established over the diseased area. The method is more suitable when accompanied by heliotherapy. There is no question in my mind that this method of treatment is the very best that one can employ. The trouble with it is that it requires two years or longer for the establishment of a cure if a cure is finally obtained. And second most patients cannot be transported to an institution of this sort because there are few institutions in this country that are equipped to take care of patients of this character like those clinics and institutions in Switzerland, Italy and Northern France. The difficulty becomes still greater when one is dealing with adult patients because most adults will not submit to a prolonged treatment such as this. The recumbency upon the Bradford frame in the overcorrected position is well known. The second method that of immobilization in a plaster of Paris cast is the method which is most commonly employed in this country. The method is extremely practical in children but it falls short when we attempt to treat Pott's disease involving the dorsal spine. When the disease attacks this portion of the spine immobilization is not possible due to the respiratory motion. In addition immobilization of the spine in a plaster cast delays calcification and therefore the healing process because of the atrophy which ensues from the prolonged immobilization.

An analysis of the cases operated upon by various men throughout the country demonstrates that internal fixation of the spine by means of a bone transplant or the fusion operation of Hibbs gives more prompt results and assures a bony fixation of the spine.

Lovett says "Although the operation is an admirable one in the cases of tuberculosis of the spine in adults, which is a more serious disease than in children, and where prolonged treatment is generally impossible when it comes to the case of children, a great many cases originally reported as successful are later to be classed as relapses." He further states that the osteoplastic operations should be done in children only when effective mechanical treatment cannot be carried out, but that in adolescent and adult life osteoplastic operations offer the best chance of a rapid and permanent cure.

The method that I have employed in these 3 cases is an osteoperiosteal bone graft taken from the tibia and placed on both sides of the spinous processes in a groove made in the laminæ and reinforced by splint grafts placed transversely, binding the two longitudinal grafts (Fig. 324). The paralysis in Pott's disease is rarely if ever brought about by bone compression as a result of distortion of the spine. Cases are seen that have a marked curvature, unusual angulation without cord involvement. On the other hand, paralysis may be, and often is present in cases with very little angulation of the spine. The paralysis may be the first symptom to call attention to disease of the spine. Paralysis is due to one of the following local conditions, and they are given in the order of importance: (1) Granuloma resulting from breaking down of the vertebrae with pus formation and extending backward, and thus producing pressure on the meninges and cord, (2) the same as above, producing a pachymeningitis with thickening from epidural exudates, (3) thrombi in the spinal blood or lymph vessels, (4) myelitis of tuberculosis origin.

**Operation**—The back and leg from which the graft is to be taken is prepared the night before operation in the usual manner. Great care is exercised in carrying out asepsis. Scopolamin ( $\frac{1}{10}$  gr.) and morphin ( $\frac{1}{8}$  gr.) is given an hour before operation and repeated one half hour later. The patient is placed in the prone position upon the operating table and the field of operation prepared by another coat of iodin which is removed with alcohol to avoid burning the skin. An elliptic incision is made, beginning well above the area involved and carried below that area. When

the disease involves the twelfth dorsal and first lumbar, for example, the incision begins above the tenth dorsal and extends

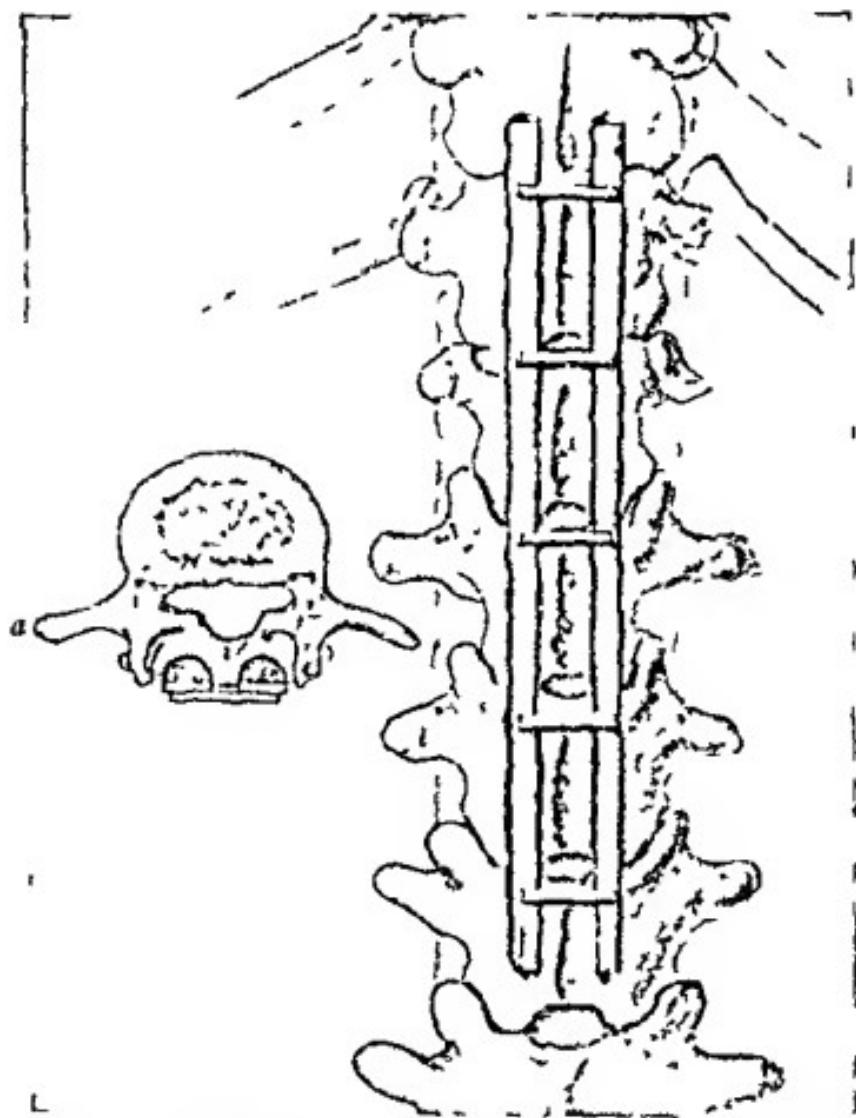


Fig. 324.—A drawing made to illustrate the method of placing the grafts in the laminae with the transverse splint grafts in position. The grafts are placed in grooves made in the laminae. The splint grafts are placed under the posterior spinal ligament. (a) Cross-section showing the longitudinal and transverse grafts in position.

below the third lumbar. The cut skin is retracted and the fascia and periosteum over the spinous processes is cut. By sharp dissection the periosteum is reflected along the lateral surfaces of

the spinous processes down to and involving the laminae. All bleeding is controlled by packs. It is quite impossible to catch all bleeding points and it also consumes considerable time in attempting to do so. Sharp and firm retraction over moist packs controls to a considerable degree the bleeding that takes place. The lateral aspect of the spinous processes and the laminae are cleaned of the remaining periosteum by a special sharp chisel. Grooves are now made in the laminae on either side for the re-



Fig 325—Case I. Shows the amount of flexion of the spine about eleven months after the operation. The patient has worn his brace all of the time, which accounts for the limitation of flexion

ception of the osteoperiosteal graft which is taken from the tibia. These two strips of bone are about  $\frac{1}{8}$  to  $\frac{1}{4}$  inch wide and extend through the thickness of the tibia. The removal of the grafts from the tibia is best accomplished by means of a wide sharp chisel. The width of the graft is first outlined by means of a sharp knife; by means of a motor saw grooves are made in the tibia along the outline, and the grafts are removed by means of

the chisel. Removing the grafts in this manner does not devitalize the graft and second it avoids the splashing which takes place when the motor saw is used. The grafts are now placed on both sides of the spinous processes in the groove made in the laminae. With a scissors a hole is made in the ligament uniting the spinous processes and a small splint graft placed in that opening. This graft is long enough so it reaches from one graft



Fig. 376.—A photograph of Case I showing the condition of the back eleven months after operation. Patient stands and walks unsupported.

dition permits, but are not allowed to bend. After the second month they are permitted to raise themselves on their elbows. After the third month a brace is fitted and worn during the day, when the patients are permitted to get out of bed and walk with the aid of crutches. The brace is removed at night, since the patient rests more comfortably without it (Fig. 325). Figure 326



Fig. 327.—x-Ray film of Case I showing the two longitudinal perivertebral osteoperiosteal bone-grafts taken from the tibia.

is a photograph taken of the patient at this time to show condition of the back. The power in his legs has returned completely. He has no bladder symptoms. His back is firm and straight. He walks with a cane because he is still afraid to trust his legs. He can walk, however, without any support.

immobilization in the plaster jacket, the deformity continued to increase and the patient did not gain in weight or strength. She is a working girl and could not continue with her work on account of the handicap of the plaster cast. In fact, she had to have some one wait on her for she could not get in or out



Fig. 330.—X Ray film of Case II showing the outer periosteal grafts in position

of her clothes nor could she stoop to fasten her shoelace. An operation was contemplated and performed as in the former case.

You will note that this girl did not come into the hospital with a complaint of backache. She came in with a complaint of radiating pain in her right side. It was a sort of pleural pain,

and because of its becoming localized in the right hypochondrium gall-bladder trouble was suspected

In the routine physical examination the deformity was discovered, and an x-ray examination of the spine was ordered and orthopedic consultation invited. Patients afflicted with tuberculosis of the spine seldom refer their discomfiture to the back



Fig. 331.—x Ray film of Case III, showing the grafts in position

Children are brought in because of disturbed sleep or a peculiar guarded gait and often because of radiating pain in the abdomen. When the deformity is well defined the diagnosis, of course, is not difficult. It is often surprising how much actual vertebral destruction can occur without marked symptoms. Every back

pain should be carefully examined and the possibility of tuberculosis borne in mind and x ray must be invariably taken

The patient at this time is perfectly well. She has gained in weight is now married does all her housework and is entirely free from pain or discomfort. She has worn a brace for one year after operation but has no support of any kind at this time.

### CASE III

Mrs C B aged thirty one entered Michael Reese Hospital May 6 1924 with the following complaint

Lumbar backache two years in duration pain in the right thigh and general weakness

**Onset and Course** —At the age of two years patient sustained an injury to the back which was followed in several months by pain in the back weakness some limitation to motion of the spine and later by the formation of an angular deformity. During childhood this was treated by casts braces etc for a period from the age of six to the age of twelve. All symptoms have subsided and have been absent until two years ago when patient gave birth to a child. A cesarean section was performed at that time. The lumbar backache is worse at night and after exertion and is of a dull aching character accompanied by pain on the right side. This pain starts in the back and shoots down the thigh to the knee. The pain is aggravated by motion and partly relieved by rest.

**Physical Examination** —This reveals a fairly well nourished woman who has a marked curvature of the spine. Heart and lungs negative. Thorax large in the anterior posterior diameter and a depressed sternum. The spine reveals a marked posterior angular deformity over the lumbar region involving the first and second third and fourth lumbar vertebrae. There is no tenderness to pressure but some limitation to motion and a small degree of muscular spasm. X Ray films reveal a destructive process involving the first second third and fourth lumbar vertebrae.

Operation was performed similar to the other cases given on May 8 1924. Patient discharged from the hospital on July 29 1924. She was able to walk home.

**Comments**—This patient was treated conservatively for a period of some months. A plaster jacket was applied involving one of her hips. The pain in the back was relieved for some time but as soon as the support was removed the pain recurred. This patient evidently had a healed tuberculosis with considerable deformity. She was not troubled with her back until she became pregnant. During her pregnancy the focus became active again, and judging from the x-ray film a fracture of the callus had occurred. It was thought at once that expectant treatment in this case was futile. The patient was given the benefit of the doubt and a plaster cast was applied.

Operation was performed on May 8, 1924.

**Comments**—Patient made an uneventful recovery. Is now free from all symptoms does her housework, and says that she never felt so well as long as she can remember.

#### CONCLUSIONS

The osteoperiosteal graft of Delageniere placed upon each side of the spinous processes and resting in grooves made in the laminae is an efficient method of internal fixation of the spine. It has the following to recommend it:

- 1 It is not a very difficult, although by no means an easy, operation to perform.
  - 2 It can be performed in about forty five minutes.
  - 3 No plaster fixation is necessary. In fact, a little motion brings about a greater osteogenesis.
  - 4 The two transplants can be made as large and as thick as one desires using stronger grafts in adult patients, and smaller, thinner ones in young persons.
  - 5 The operation is followed by little shock.
- The 3 patients made an uneventful recovery.



CLINIC OF DRs. RALPH B. BETTMAN AND  
MAX BIESENTHAL

MICHAEL REESE HOSPITAL

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BILATERAL BRONCHIECTASIS

DR. BIESENTHAL: The most frequent chronic lung condition is that of pulmonary tuberculosis, yet many times we are asked to pass on cases diagnosed as such, which, after due consideration to all data, prove to be non-tuberculous. We are bringing before you today a clinical study illustrating this fact.

The young man, M. F., is twenty-six years of age. He is single and engaged in clerical work. His history of previous diseases is that he had measles and scarlet fever in childhood, pneumonia at three periods of his life—at the ages of nine, fifteen, and twenty-two respectively, and the flu in 1924. In 1921 a tonsillectomy was done. In addition is the general statement that he has always been subject to colds and has had a chronic cough for the past fifteen years. He was inducted into the army in 1917, but was mustered out shortly thereafter on account of physical disability.

The patient dates his present trouble to the year 1920, when he had pneumonia which confined him to bed for three months. Following this the cough became aggravated and the amount of sputum markedly increased. In 1924 he had pleurisy and the flu. In the second week of this illness he had a pulmonary hemorrhage of about 16 ounces. From this time on he gradually became worse. The sputum became fetid, blood tinged at times, and averaged in amount from 16 to 20 ounces daily.

He states that he has no dyspnea, night-sweats, or chest pains. His appetite is fair. He is gradually losing weight and strength.

Physical examination is negative except for the pulmonary findings. The left side of the chest appears larger than the right. The upper lobes of both lungs are normal in resonance, the apices are normal in width and freely movable. As you will observe the percussion note is dull over the lower lobe of the left lung. There is also impairment of resonance over the lower lobe of the right lung. The breath tones over the dull area on the left side are suppressed and there are heard small moist rales at the end of inspiration. A few crackles are to be heard at the base of the right lung.

The laboratory reports are as follows. Urine negative for all tests. Hemoglobin is 75 per cent red blood cells 5,290,000 and white cells 12,700. Wassermann test is negative. Repeated examinations of the sputum failed to reveal tubercle bacilli. A few fusiform bacilli and spirochetes were found. The x-ray plates show that we have pathology in the lower lung fields especially the left suggestive of a bronchiectasis.

His temperature range is from 98° to 99° F., pulse 80 to 96 and respirations 18 to 22.

The young man was originally referred to us as a suspected pulmonary tuberculosis. Let us consider this diagnosis in the light of the history, physical findings and laboratory reports. That the pathology is in the bases of the lungs is clear to all of us. This speaks against a probable tuberculous infection. About 90 per cent of all lung lesions in the lower lobes are non-tuberculous and about 90 per cent of all lesions in the upper lobes are due to the ravages of the tubercle bacilli.

Next we must consider the course prolonged over at least ten years and in the years when if due to tuberculosis chronicity is the exception and the acute type of tuberculosis the usual picture. We must take into consideration that all examinations of the sputum are negative for tubercle bacilli. When we repeatedly fail to find the bacilli in an apparently active lung disease then the possibility must be borne in mind that another type of infection is present and not a tuberculosis. This does not always hold true yet in a careful study of a large number of cases of active pulmonary disease where we fail to find tubercle

bacilli, the ultimate diagnosis confirmed by autopsy is that of a non tuberculous condition

Are we dealing with a chronic lung abscess—a diagnosis quite logical in view of the previous history? Pneumonia is the second most frequent cause of lung abscess, the first being operations on the nose or throat, especially tonsillectomies under general anesthesia. Our lesion is bilateral while a chronic lung abscess is usually unilateral. The absence of a history of an acute onset with pain, temperature, and large quantities of fetid sputum rather point away from such a pathologic possibility. Again, the x ray plates are not suggestive of such a lesion.

Now and then a lung syphilis will give both the history and findings such as we have in our patient. Again we must remember that the usual site of specific lung involvement is in the upper lobe. Our patient has had several negative blood Wassermanns.

A question as to lung malignancy is easily answered. The length of time the process has existed, the absence of pain and the slight loss of weight and strength speak against any form of malignancy.

Then what is the probable diagnosis? A bilateral bronchiectasis is my answer, coming on after repeated attacks of pneumonia, with a history of a chronic, gradually increasing cough, and a fetid sputum associated at times with small hemorrhages. We see cases of this type associated with a pulmonary tuberculosis but here that factor is apparently absent. The roentgenogram is that of a bronchiectatic condition and therefore our final diagnosis is a bilateral bronchiectasis with the greater involvement in the base of the left lung.

What can the internist do for this or any other patient so afflicted? Unfortunately, very little. The usual cough remedies are of no value. Creosote and all its derivatives avail not. Inhalations may help for a short period, but soon lose their efficacy. Postural drainage does some good but not to the extent that it helps in cases of lung abscess. The various arsenical preparations likewise are of no value even in cases where spirochetes are found. A few cases have been reported where hipiodol used for

diagnostic purposes has apparently aided the patient to partial recovery, but these case reports are not conclusive. Bronchoscopic irrigations have been tried and have proved of little avail.

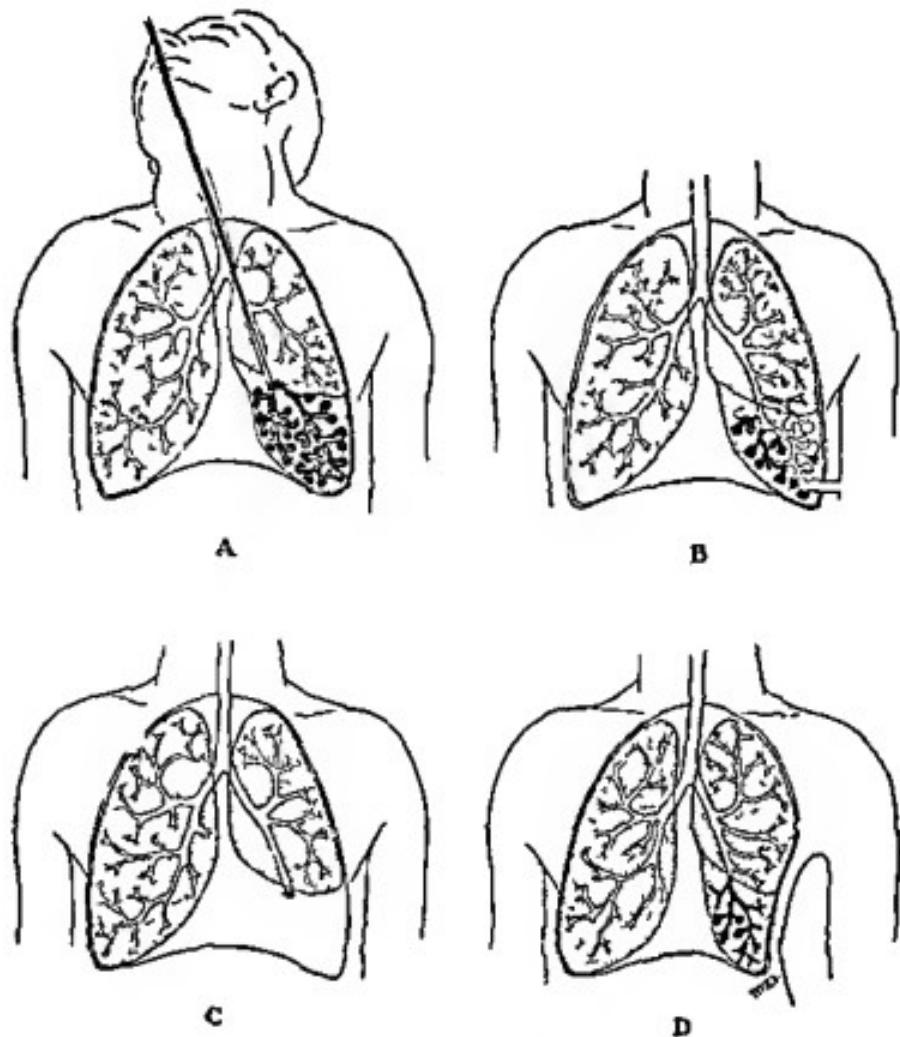


Fig. 332.—Various methods, which have been advocated in bronchiectasis. A. Bronchoscopy with bronchial irrigation and aspiration. B. Bronchostomy. Note the surprisingly large amount of lung drained by tapping a single bronchiectatic cavity. C. Lobectomy. D. Extrapleural thoracoplasty. Note the uniform collapse of the firm walled bronchial cavities does not occur.

So we must come to the conclusion that medicinal aid to our patient is *more or less futile* and refer him to the thoracic surgeon for relief.

**DR. BETTMAN:** Dr. Biesenthal has told you what medicine has to offer in this case; I will tell you what surgery can do.

There are four surgical procedures which might be considered. The first and least radical is bronchostomy. By this I mean making one or more incisions in the chest cavity, preferably by rib resection, and after firm adhesions have been formed between the visceral and parietal pleura, cutting into the lung until some large bronchiectatic cavity is reached.

If a drainage-tube is now inserted and left in place for a long time, a chronic, if not permanent, fistula results. This fistula not only drains the particular bronchiectatic cavity which happens to have been opened but also drains many of the communicating cavities. The amount of lung thus drained from a single bronchostomy is sometimes surprising. This method is indicated in patients who are extremely toxic and who might not be able to withstand the more radical procedures. It is an excellent primary step to the operation of cautery lobectomy. In cases with marked bilateral bronchiectasis it is possible to drain both sides by bronchostomy. On the other hand, bronchostomy does not eradicate the disease. The bronchiectatic cavities not drained still continue to discharge their purulent contents by way of the sputum, some absorption of the toxic products continues, and when the bronchostomy opening closes the entire disease syndrome returns.

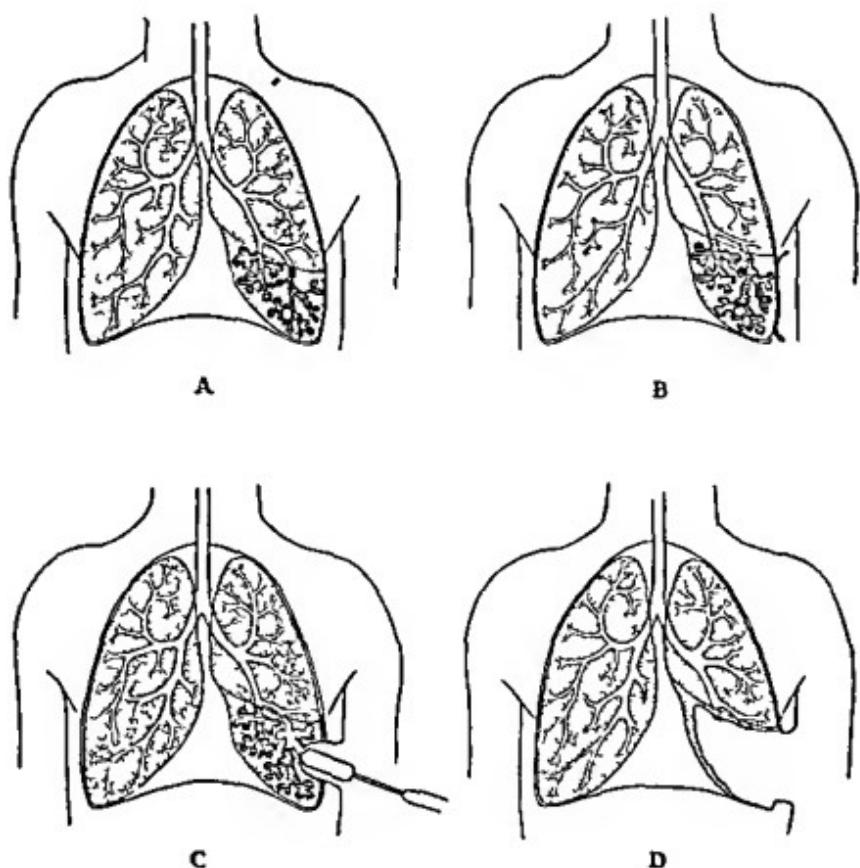
The second method which might be considered is excision of the affected lobe of the lung. Lobectomy removes the pathologic tissue, and if the patient survives the operation and its complications he is cured. However, lobectomy is a formidable procedure. Even in cases in which no infection is present, where the actual operation is comparatively simple, the mortality from lobectomy is high. The greatest difficulty lies in the fact that it is almost impossible to close the bronchial stump permanently. After five days the bronchial stump reopens and the patient dies from a tension pneumothorax, a mediastinal emphysema, or a massive infection. Lilienthal has described a method of dealing with the bronchial stump which allows for the sloughing of the bronchial ligature. In his hands this does much to combat this

danger. In the case of a bronchiectatic lung however lobectomy has new dangers. Close to the hilus are bronchi filled with purulent material. It is almost impossible not to contaminate the surrounding structures when amputating the lung. Furthermore separate ligatures of the vessels and the bronchus are out of the question because of the technical difficulties of separating the structures involved in the inflammatory mass. Also adhesions have formed here and there between the chest wall and the bronchiectatic lobe making the mere delivery of the affected lung a difficult task.

The third operation which we could have used for this patient is to collapse the affected lung by extrapleural thoracoplasty. In this operation sufficient lengths of ribs starting as near the spinal articulation as possible are removed in order to collapse the underlying lung. The pleural cavity is not opened therefore no danger from infection is present. The operation is simple and the operative mortality in skilled hands is negligible. This operation however does not seem logical to me. I am positive that the thick and rigid walls of the old bronchiectatic cavities do not yield to the comparatively small amount of pressure which can be exerted upon them through thoracoplasty. Were the mediastinum a rigid bone like membrane against which the collapsed lung could be compressed then thoracoplasty might do what its advocates expect. The mediastinum even in presence of prolonged infection is yielding and is unable to exert the necessary counterpressure to obliterate the bronchiectatic cavities. I hope to be able to demonstrate this with lipiodol in the first case I get in which an extrapleural thoracoplasty has been done. Not long ago it was shown at one of our medical meetings that by the use of lipiodol limited thoracoplasty was only partially successful in obliterating certain lung abscesses. That the inherent elasticity of the lung itself is not able to obliterate the bronchiectatic cavity is apparent to any one who has seen the gaping bronchi on cross section of a lung removed at postmortem.

Up to a few years ago I would have stopped at this point and as the lawyers say have rested my case but thanks to the work

of Dr. Evarts A. Graham I have still the most powerful evidence for my patient. Graham has devised a method of lobectomy which rids it not only of the dangers of infection, and of re-opening of the bronchial stump, but also of its technical difficulties. This operation has been designated as *cautery lobectomy*, and this



*Fig. 333.—The operation of choice for bronchiectasis—Graham's cautery lobectomy (diagrammatic). A Preoperative condition. B Preliminary step—the formation of adhesions. C Adhesions have been formed, a large thoracotomy wound made, and the affected lung is being removed piecemeal. D The entire affected portion of the lung has been removed.*

is the operation which I performed upon our patient here, and which I will describe in brief.

I first resected portions of the tenth, ninth, and eighth ribs so as to allow easy access to the affected lobe and then packed between the pleura to stimulate adhesions. A week later the

wound was reopened and it was found that the bronchiectatic lobe was well walled off from the rest of the pleural space by firm adhesions. With an actual cautery the visceral pleura of the exposed portion of the bronchiectatic lobe together with a small amount of the underlying lung tissue was cauterized. There was a slight amount of bleeding which was easily controlled by packing. Bleeding in operations of the lung because of the low blood pressure of the pulmonary system is easily stopped by a small amount of pressure. Two days later in the ward without having to move the patient from his bed and without having to use any anesthetic whatsoever more of the bronchiectatic lung was destroyed by cautery. From then on every third day an additional amount of bronchiectatic lung was removed until finally a complete lobectomy was accomplished. The patient started to improve after the first few cauterizations as the bronchiectatic cavities were opened and drainage established. His sputum became less as the discharge from the cauterized lung surfaces increased. Finally when almost all of the affected lung had been removed not only the sputum but also the drainage from the wound lessened until it almost stopped. The wound closed remarkably quickly so quickly in fact that in subsequent cases I have made larger primary exposures.

As you see the patient is apparently in good condition. He has gained 20 pounds in weight since his operation. His sputum has greatly diminished and the fetid odor has almost disappeared. Perhaps nothing has pleased the patient as much as the disappearance of the objectionable odor which for years made him a social outcast. He has not returned to work being in a fortunate economic position. The wound has closed entirely except for this single bronchial fistula. Whether or not this will close spontaneously I do not know. At present it still drains about  $\frac{1}{2}$  ounce of pus a day. It does not inconvenience the patient so I see no reason for attempting to close it. The small amount of sputum (one half sputum cup) and some of the pus from the fistula undoubtedly came from the patient's opposite lung. I am interested to see whether or not this condition will clear up.

spontaneously now that the main seat of disease has been removed

In summary I would say that we presented a case of bronchiectasis, bilateral but mainly in the left lower lobe which has been successfully treated by cautery lobectomy. The interest in the case lies in the fact that a condition considered as hopeless by the vast majority of medical men is actually amenable to treatment.



## CLINIC OF DR VINCENT J O CONOR

WASHINGTON BOULEVARD HOSPITAL

### HYDRONEPHROSIS, INFECTED HYDRONEPHROSIS, AND PYONEPHROSIS

WHEN the outflow of urine from the renal pelvis or ureter is partially or slowly obstructed with a resultant dilatation by the retained aseptic urine, the condition is spoken of as *hydronephrosis*. When infection occurs in conjunction with the urinary retention the term *infected hydronephrosis* is used. In the more severe form of infection occurring in the course of a hydronephrosis, where the process was primarily and essentially suppurative resulting in a more or less complete destruction of renal tissue and a retention of this detritus and pus, the term *pyonephrosis* is more properly used to designate the condition.

Thus it is seen that these three terms are used to describe various stages of the same obstructive process. Hydronephrosis resulting from obstruction without infection with moderate or low grade infection, or with severe and massively destructive infection.

In order to clearly understand the mechanism by which hydronephrosis occurs it is necessary to consider a variety of processes. The character and extent of ureteral or pelvic obstruction, the arterial blood supply, the venous drainage, and the influence of these changes upon the sympathetic nerve-supply to the kidney and its collecting tubules.

We will not go extensively into this experimental work today, but I think it is important to summarize a part of our present knowledge of this complex mechanism.

Normally the pressure in the renal tubules and glomeruli, called "secretory pressure," exceeds the intrapelvic and intraureteral pressure. As the retained urine accumulates under

pressure the distention of pelvis and calyces is followed by back pressure in the renal tubules and a resultant atrophy, first of the tubular structures, then of the pyramids and cortex, occurs as the intrapelvic pressure gradually equalizes or exceeds the secretory pressure. The content of a closed hydronephrosis is neither cumulative nor stagnant but undergoes a continuous change, fresh material being secreted by the kidney and the excess removed by an active reabsorption which mainly occurs by back flow from renal pelvis through the venous channels. Complete obstruction occurring suddenly and remaining permanently may or may not give rise to a hydronephrosis. This depends upon the renal blood supply and the presence or absence of renal infection. If the latter occurs no hydronephrosis results and there is a resulting anuria and primary atrophy of the kidney. Interference with the arterial blood supply of the kidney in the presence of marked or complete urinary obstruction favors a more rapid development of hydronephrosis probably due to the lessened resistance of the degenerating parenchyma to urinary back pressure.

Clinically, the usual hydronephrosis encountered results from partial or intermittent obstruction of the pelvis or ureter. These dilated sacs attain much greater proportions than when the obstruction is more complete and not intermittent. Hydronephrosis is more common in the female than in the male and is present more often on the right than the left side. It is the result of either congenital or acquired conditions obstructing the outflow from the kidney.

Among the congenital causes may be listed faulty development of the ureteral lumen with constrictions at any portion of its course especially stenosis at the ureteropelvic junction and at the ureteral opening into the bladder, anomalies of position of the kidney with resultant torsion and constriction of the ureter, valve like formations within the ureteral lumen, vessels to the kidney which are so anomalous in position that they press upon the ureter and kink it sufficiently to impede the flow of urine, abnormally high insertion of the ureter in the pelvis allowing lack of drainage from its dependent portion. We will

not discuss today the bilateral uronephrosis resulting from congenital obstruction at the bladder outlet

Acquired hydronephrosis may arise from causes within the urinary tract itself or may result from ureteral compression by lesions of neighboring structures

The most common of these are calculi impacted in ureter or ureteropelvic junction, strictures of the ureter following injury or inflammation of its wall, obstructions due to neoplasms either primary in the pelvis or ureter, abnormally movable kidney with intermittent ureteral obstruction, inflammatory processes about the ureter and renal pelvis especially in the region of the appendix in the male and the broad ligaments in the female abdominal and pelvic tumors, metastatic enlargement of the retroperitoneal lymph nodes, unusually large calcifications of the lumbar nodes

I wish to present today 3 cases illustrative of the subject matter just covered

The first, a unilateral hydronephrosis in a young man due to pressure on the ureter by an anomalous renal artery

The second, a unilateral infected hydronephrosis occurring years after a traumatic injury and attaining the largest size of any hydronephrosis which I have ever seen recorded. The exact diagnosis in this case was not made for years after the onset of symptoms

The third, an unusually large pyonephrosis in a woman of sixty which had been so gradual in its development that here also a rather difficult diagnostic problem was presented

**Case I—S. T.**, a vigorous young man, aged twenty two, referred by Dr. Frink of Elkhart. His general health had always been excellent and his family history was unimportant

For five years he had complained of a dull aching pain in the left upper abdomen and back. There had never been any radiation of the pain either to the chest, lower abdomen, or groin. During the first two years the pain was not severe and caused him no alarm, but more recently it became persistent and there was a constant annoying ache present, although never any acute cramp like distress

There were no abnormal cardiorespiratory or gastrointestinal symptoms and no undue frequency of urination dysuria, or nocturia. The urine had never been discolored or apparently abnormal.

Repeated physical examinations, including gastro intestinal



Fig. 334.—Left hydronephrosis due to obstruction at the ureteropelvic junction by an anomalous renal artery.

fluoroscopy, urine and stool examinations revealed nothing abnormal.

Physical examination on admittance to the hospital showed normal heart lungs blood pressure, reflexes, etc. The kidneys were not palpable but deep pressure in the left costovertebral angle elicited a mild sense of discomfort.

Repeated urinalyses were normal in every respect, as was

the twenty-four-hour urine and intake and output requirements for fluids. Plain x-ray showed normal kidney outlines and no shadow suggestive of stone.

Cystoscopic examination revealed a normal urethra and bladder and the ureters were easily catheterized 30 cm with a No 6 F. catheter. The flow of urine from the left catheter was



Fig. 335.—Showing normal right ureteropyelogram and collapsed hydro-nephrotic sac on left after ureteral catheter evacuation

rapid and excessive and 250 c.c. of clear urine was aspirated by syringe suction without difficulty in a few minutes. The flow from the right was of normal rate and the capacity of the pelvis estimated at 10 c.c.

Phenolsulphonephthalein injected intravenously appeared in three minutes from the right and in ten minutes from the left. Thirty per cent. was excreted in thirty minutes from the right

and only 5 per cent from the left. Cultures from both kidneys proved sterile.

Pyelograms (Figs. 334, 335) made with 12.5 per cent sodium iodid solution showed a hydronephrosis on the left, which terminated abruptly at the ureteropelvic junction, suggesting a constriction at this point. The right ureteropyelogram was normal.

Operation was advised, and it was suggested that, if possible, the kidney would be conserved, and either ligation of the constricting band or artery done or a plastic operation performed to re-establish normal ureteral drainage.

Operation was performed under ether anesthesia through a lumbar incision. A very large hydronephrotic sac was encountered and the region of constriction was obviously due to an anomalous renal artery so tightly compressing the ureter that it was looped over the artery, and producing a condition similar to that of a garden hose thrown over a fence. In this instance there was no arterial blood supply at the hilum of the kidney, this nutrient being supplied by a large vessel at either pole. In these cases it is unwise to ligate the artery since it has been shown that frequently the arterial supply of the kidney is entirely segmental and no anastomosis of the upper and lower arteries occurs in the substance of the kidney. Ligation in these instances may result in necrosis of one half of the kidney. Since a plastic operation did not appear advisable, the kidney was removed in the usual manner.

Convalescence was uneventful and the young man has been entirely free from pain since leaving the hospital.

**Case II**—Dr. F. S., German American aged fifty six years, was referred by his son to the Washington Boulevard Hospital on November 9, 1925 complaining of general weakness and malaise, clouded mentality, speech impediment, and pain in right lower abdomen.

*Present illness* is best described by beginning five years back.

While visiting in Hamburg patient had a sudden profuse gastric hemorrhage amounting to several quarts. Nausea and

vomiting continued for some days and patient became so weak he lost the power of speech Surgeons advised laparotomy, but patient refused, and spent four months gradually regaining his strength He returned to America and resumed practice His speech returned slowly Nausea and occasional vomiting spells continued, and two years ago he had complete examination, including fluoroscopy of stomach and bowel These showed marked distortion of the pylorus and duodenum and an almost complete left sided transposition of all intestinal coils A diagnosis of inoperable carcinoma of the stomach was made on the basis of the gastric hemorrhage, continued nausea and vomiting and the filling defects noted by x ray

Exploratory operation performed by a very competent surgeon failed to disclose any intra abdominal pathology except adhesions about the pylorus, and the incision was closed after separation of these

Following the operation the patient was relieved of his previous gastric distress, but became increasingly languid and dull Six months later he began to note considerable pus in his urine, but had no urinary symptoms Cystoscopic examination a year ago was performed, and the patient was told he had strictures of both ureters, although no x ray examination was made The patient became progressively weaker and would frequently fall asleep at his work For some months past he had a slight dull aching pain in the right lower abdomen, but this was neither constant nor severe

*Past History*—Twenty years ago patient was kicked in the right side by a horse and had considerable pain in the region of the right kidney for several days There was profuse hematuria for two days A diagnosis of "rupture of Glisson's capsule" was made by Dr Christian Tenger, and after a week of rest all symptoms disappeared Otherwise the patient had enjoyed splendid health until five years ago

*Physical examination* showed no abnormality Reflexes, heart and lungs, palpation of abdomen are recorded as normal Rectal examination was negative Blood pressure 120/80 Temperature on admission 99° F , pulse 80, respiration 18

*Blood* Leukocytes 9000 hemoglobin 80 per cent

*Urine* Specific gravity 1025 4 mm ring of serum albumen no sugar no casts many pus cells no blood

*Cystoscopic Examination*—Bladder capacity normal no residual urine no prostatic enlargement slight hyperemia of trigone no stone tumor or diverticulum Ureteral orifices of



Fig. 336 Plain radiogram with opaque catheters in ureters Note the symmetry of lessened density over the entire right side

normal size Purulent material about right orifice but no efflux noted Left ureteral efflux active normal and clear

No 6 F catheters passed easily 30 cm A rapid flow of very cloudy purulent urine occurred from the right catheter a more normal flow of clear urine from left On aspiration with a syringe 1100 c.c. of purulent fluid was withdrawn from the right during which time 20 c.c. of clear urine appeared from the left

Phenolphthalein injected intravenously appeared in three minutes from the left and 22 per cent. was excreted in fifteen minutes. No dye ever appeared from the right.

One hundred cubic centimeters of 12.5 per cent sodium iodid solution was injected into the right kidney (Figs. 336, 337). The

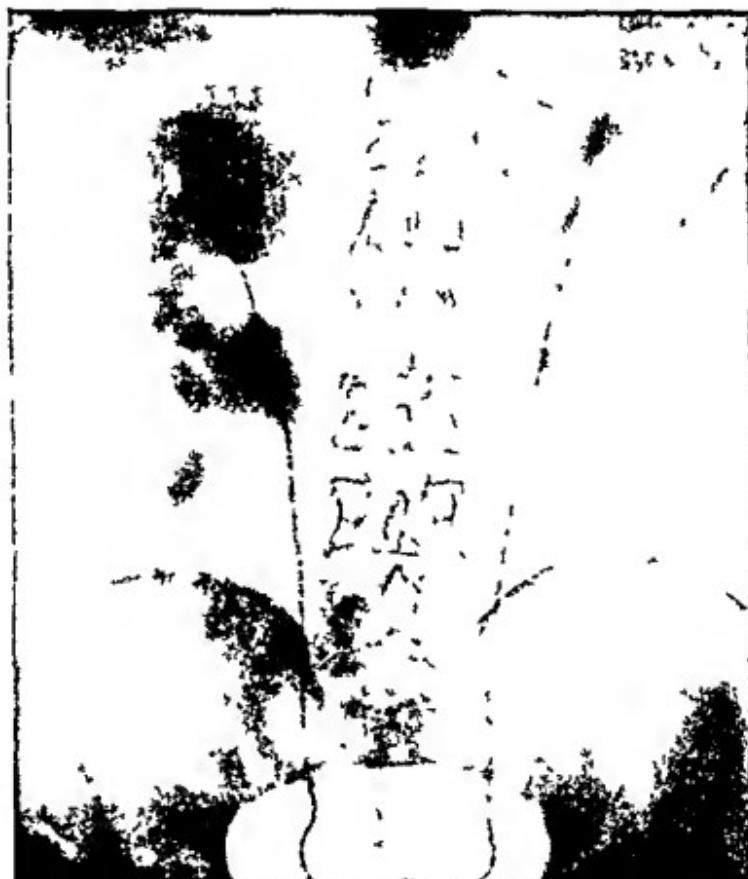


Fig. 337.—Enormous hydronephrosis filling the entire right half of the abdomen. Only 250 c.c. of 12.5 per cent sodium iodid solution were used in making this picture, although the sac had a residual capacity of from 2500 to 2800 c.c.

pyelogram showed an opaque area filling the entire right abdomen from the costal margin above to well below the iliac crest. This was obviously a very large pyonephrosis.

The catheter was retained in the right kidney for three days, and at frequent intervals suction by syringe removed from 1 to 3 ounces of purulent fluid.

The patient's mental and physical improvement in twenty-four hours was striking. He felt less dull and said he "could think straight for the first time in months." Blood urea nitrogen on November 11, 1925 was 17.8 mgm per 100 c.c.

After three days the ureteral catheter was removed from the right kidney and another No. 6 F catheter inserted. The patient and interns tried to assist the usual drainage by frequent suction



Fig. 338.—Photograph of specimen from Case II

On November 17, 1925, under scopolamin morphin and light ether anesthesia, an extensive right lumbar incision was made and an extraperitoneal mobilization of the very large, but now somewhat collapsed, kidney shell was accomplished. The mass was adherent below the level of the bifurcation of the iliac

vessels and extended upward to the diaphragm Careful dissection was necessary in the region of the upper pole along the median border because of firm adhesions to the posterior wall at the hepatic flexure of the colon The mass was removed intact and the wound closed with drainage

The specimen when evacuated weighed 460 gm , was 23 5 cm by 14 cm by 4 5 cm (Fig 338) The parenchyma was 2 mm to 5 mm in thickness and all normal kidney tissue was absent There were twelve pockets 1 to 5 cm in diameter communicating with the pelvis These were distended with brownish fluid The renal arteries and veins were patent

*Microscopic Examination* —Renal pyramids are absent and the cortex merely a narrow strip No acute inflammation even at the pelvis margin The glomeruli were compressed with a wide capsular space about them and the convoluted tubules are dilated No evidence of tuberculosis (E R LeCount)

The patient made an uneventful convalescence, leaving the hospital on December 4, 1925 (sixteen days after operation) with the incision firmly healed

At present he is in splendid health and attending to his practice His urine has no albumen sugar, or casts, and only a very rare pus cell on centrifuged specimen He has gained 20 pounds in weight since leaving the hospital and sleeps and eats well

**Case III** —Flora K American single school teacher, aged sixty, was seen with Dr Frederick Tice at the Washington Boulevard Hospital April 30, 1924 Her immediate complaint was of two weeks duration and consisted of a persistent dull ache in the left flank and abdomen associated with weakness and general malaise For one week the patient had an intermittent fever with temperature to 102° F Pain had never been colicky or cramp like, no frequency dysuria or hematuria ever noted Bowels somewhat constipated for two weeks, necessitating frequent catharsis

*Family history* not important

*Past History* —General health always good Malaria in childhood Menopause six years ago At the age of fourteen

had attacks of pain in left side and back, dull and intermittent, usually lasting for two or three days. No urinary symptoms. After four years the pain gave no further trouble until about five years ago, when she had pain in the same region lasting for one week. Her physician diagnosed a movable kidney at this time, but the pain did not recur until two weeks ago. Appetite had been poor for several weeks and patient had slept but little.

*Physical Examination*—*Mouth* had been dry and tongue thick, dry, and sore for two weeks. *generalized stomatitis*

*Teeth* in excellent condition none devitalized

*Tonsils* atrophic and apparently normal

*Heart and lungs* negative

*Abdomen*—The entire left abdomen was filled with a hard, rather irregular tumor mass which was definitely ballotable through the flank. There was practically no pain on pressure and no fluid wave. No visible intestinal peristalsis. Slight pain on pressure in costovertebral region.

*Vaginal* not made

*Rectal* negative

*Extremities* normal no edema or varices

Temperature on admission  $101.2^{\circ}$  F and varied in twenty-four hour period for several days from  $100^{\circ}$  to  $103^{\circ}$  F, with an occasional chill and temperature rising to  $104^{\circ}$  and  $105^{\circ}$  F. At these times the pulse rate rose to 120 to 130 and respirations to 28 to 30.

*Blood* Reds 3,800,000 whites 9900, hemoglobin 60 per cent. Blood pressure 166 systolic and 88 diastolic.

*Urine* 1015, albumin ++ no sugar, no pus or casts

*Stool* negative

*Blood urea* 28 mgm per 100 cc

*x Ray Examination*—Films of abdomen showed normal appearing liver shadow and an unusually large kidney shadow on the right side. On the left side was another shadow, seen on films taken with patient on back and abdomen, regular in outline, extending from the level of the eleventh rib to the iliac crest and from the midline to the lateral margin of the body shadow. This shadow suggested a large hydronephrosis or kidney tumor. A

calcified gland was seen just below the lower pole of the right kidney

*Colon Fluoroscopy* —Colon filled with unusual rapidity, was reduced in calibre, slightly displaced by tumor mass but apparently normal and anterior to tumor



Fig. 339.—Pyelogram of Case III. Note the outline of the left sided tumor mass as depicted by the barium solution which has been retained in the bowel for seventy two hours. The left ureteral catheter is displaced to the right of the spine and the outline of the renal pelvis is seen in the center of the tumor outline. It is a small elliptic shaped shadow with no evidence of normal outline remaining. No outline of calices remains.

*Cystoscopy* —Bladder normal, no residual. No 6 catheters passed 28 cm on either side. No urine flow from left, no pus, etc., when irrigated through catheter. Right profuse flow, trace of albumin, specific gravity 1018, rare pus cell. Phenolphthalein

appeared in four minutes from right, and 20 per cent excreted in twenty minutes. No flow from left kidney.

*x* Rays with catheters in the ureters showed marked displacement of left catheter to the right. Four centimeters from the end of the left catheter is an accumulation of opaque material of triangular shape about the size of a normal pelvis but there are no calyx outlines and the pelvis seemed compressed from all sides (Fig. 439).

The diagnosis lay between a large infected hydronephrosis and a solid tumor of the kidney with secondary infection. The urologic findings and pyelogram coupled with the nature of the mass suggested a probable hypernephroma.

It was decided to open the abdomen incise the posterior peritoneum and attempt a preliminary ligation of the renal pedicle.

*Operation May 7, 1924.* Midline abdominal incision separating intestines and incising ligament of Treitz. The mass was so large that it overlapped the aorta and isolation of the renal pedicle was impossible. As the tumor edge was dissected free an area of fluctuation was noted and a needle was introduced and 20 cc. of purulent fluid was aspirated into a syringe. It was then evident that we were dealing with a saccular, walled off massive pyonephrosis and not a solid tumor of the kidney. The large aspirator connected with a water pump was surrounded by a purse string suture and 2600 cc. of purulent fluid was evacuated. The opening in the collapsed sac was closed and the entire shell was freed after ligating a small sclerotic renal pedicle. The wall of the sac was very adherent as far down as the level of the bifurcation of the iliac vessels but was removed en masse without further perforation. A stab wound in the loin was made and a large tube placed in the renal fossa. The posterior peritoneum and abdominal wall were then closed without other drainage.

The sac when distended measured 22 cm. by 11 cm. by 7 cm. The lining of the pelvis was pink to red with engorged vessels and the kidney consisted of no parenchyma but many varying sized cysts up to 8 to 10 mm. in diameter enclosed in a dense

fibrous capsule and communicating with one another through small foramina (Fig. 340).

The patient made an uneventful, although somewhat prolonged, convalescence, leaving the hospital on June 14th. Her health since has been better than for years. She has gained 25 pounds and is active in her teaching and housework.



Fig. 340—Photograph of specimen from Case III.

On January 15, 1925 the patient was well. Urine showed no albumen, casts, or pus-cells, and blood-pressure was 165/100.

In conclusion it might be stated that these cases illustrate forcibly the value of complete and exact urologic study in all conditions where obscure abdominal pain persists.

Emptying of the hydronephrotic sac by ureteral catheter either for a prolonged period prior to operation, or immediately before making the incision, is of great aid in allowing an easier mobilization of the enlarged kidney and a safer nephrectomy.



## COOK COUNTY HOSPITAL CLINIC

### COOK COUNTY HOSPITAL

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#### BILIARY DISEASE

DR PAUL STARR From the Medical Standpoint

DR EDWARD S BLAINE From the x-Ray Viewpoint

DR R W MCNEALY From the Surgical Standpoint

#### BILIARY DISEASE FROM THE MEDICAL STANDPOINT

DR PAUL STARR

In disease of the gall bladder the immediate pathologic changes are in the wall. There is also evidence of abnormal bile metabolism, cholesterosis is present, cholangitis and hepatitis are equally important elements. Disease of the gall bladder more over, does not occur alone, it is a part, sometimes a very minor part, of pathologic changes which involve simultaneously the liver, the bile ducts, the pancreas, and the duodenum. Gall stones are incidental and secondary to these changes. Disturbed function in these five organs produces the syndrome commonly called chronic cholecystitis.

#### PATHOGENESIS

A Cholecystitis as an Infectious Process—Cholecystitis is commonly associated with infection. This may be due to ascending infection from the duodenum as part of a cholangitis (Brule, Jones) although this is not the common route (Rolleston). The important path is through the liver, the bacteria, perhaps pass through the liver parenchyma and down the bile capillaries into the duct. They infect the gall bladder if conditions are favorable (Thiroloix). Virulent organisms also reach the organ directly by way of the blood stream, coming from a distant

focus (Rosenow), or there may be a lesion in the abdomen drained by the portal veins, producing embolic infection through the liver.

It is probable from the demonstration of the intimate lymphatic connections of the liver and gall bladder by Graham that bacteria may also pass across directly from the liver parenchyma to the wall of the gall bladder through lymphatics. In the cholecystitis following typhoid fever a pure culture of the typhoid bacillus has been found. This may serve as an example of cholecystitis due to excessive virulence in the infecting organisms. It is probable however, that as has been suggested, certain favorable conditions may be finally responsible in most cases for the occurrence of chronic inflammation of this viscus.

**B Cholecystitis as a Result of Abnormal Bile** —The simplest example of abnormal bile chemistry as a causal agent is the pure cholesterol stone formed without any previous infection (Aschoff). The irritation of this as a foreign body is thought to favor infection. But without an actual stone the coincidence of cholesterol crystal deposits and cholecystitis has been proved (Jones McCarty Mentzer). These observers and others have shown that the deposits of lipid material in the walls of the strawberry and papillomatous gall bladders are cholesterol and apply the term cholesterosis to this condition. It would seem impossible to say however that infection does not precede and lead to the cholesterol deposit. If this were the only factor however, the incidence of cholecystitis should not be so famously specialized among those who are "fair, fat, and forty," i.e., it should occur with equal frequency among the thin, who are certainly just as liable to harbor infectious foci.

It is true that of the 3 cases used as examples later 2 are in thin men one young and the other old nevertheless the frequency of cholecystitis in the obese is generally recognized. Furthermore cholecystitis even without stones occurs twice as often in women as in men (Mayo) and 80 per cent of the women have their first attack during pregnancy or the puerperium. This is probably related to the increase of blood cholesterol during

pregnancy. In addition, it is stated that gall-stones are ten times as common in women who have borne children as in those who are sterile (Rolleston). It is also now established that increase in blood cholesterol does produce increased bile cholesterol (McNee), and that an increase of fat in the diet does increase blood cholesterol (Knudson), while a decrease in fat in the diet does reduce the blood cholesterol (Wilensky). Against this chain of evidence must be set two simple facts all obese people do not have cholecystitis, and all people who have cholecystitis are not obese. Moreover, in any series of cases of cholecystitis and cholelithiasis high blood cholesterol figures are not always present (Reimann).

The upshot of this contradiction is that obesity with high blood cholesterol concentrations definitely leads to cholecystitis with the later aid of superimposed infection in the vast majority of cases, but that infection of the gall-bladder is not uncommon, and, furthermore, that once started, infection may continue when the metabolic disturbance is no longer present. The prophylactic indication here is then to prevent and remove obesity, especially in women following childbirth. The therapeutic value of weight reduction by diet as a check on this pathologic process and as a symptomatic treatment will be later emphasized.

#### CLINICAL TYPES

The patient who gives a history of attacks of excruciating pain radiating through the right upper quadrant to the shoulder-blade, requiring morphin for relief, and who subsequently has jaundice, does not present any serious diagnostic or therapeutic problem. He has gall-stones, and, having experienced such terrifying pain, is willing to subject himself to the operation which is indicated not merely for relief from future attacks of pain, but for insurance against dangerous suppuration. There are, however, many cases of cholecystitis which do not present this crucial syndrome. They present a difficult problem in diagnosis, and the physician is often uncertain as to the wisest therapeutic campaign. Operation is dangerous; is it required? The complaint is distressing; can it be relieved medically? These cases may be

divided arbitrarily into three groups, for each of which a single example is presented

1 Patients whose chief presenting symptom is chronic indigestion

2 Those in whom epigastric distress is the prominent complaint

3 Those who have repeated attacks of chills and fever

Probably every case of chronic cholecystitis does combine these three characteristics—dyspepsia, pain, and fever—but usually one of these is predominant. These chief symptoms are dependent on the anatomic and physiologic relations of the infected gall bladder. Gastric symptoms are due to the intimate mechanical relation between the gall bladder, duodenum, and stomach which is called into play during the early period of gastroduodenal digestive motion. Pain is dependent on the nerve endings in peritoneal surfaces about the gall bladder and its ligaments. Fever is dependent on the infection present, which invariably produces a cholangitis by way of the ducts and a hepatitis by way of lymphatic drainage into the adjacent liver (Graham). The three syndromes of cholecystitis thus may be characterized chiefly by gastric symptoms, chiefly by pain, or chiefly by fever, but all three are usually present.

#### CHOLECYSTITIS PRODUCING INDIGESTION

The gastric symptoms of cholecystitis are essentially *dyspepsia during early digestion*—*i.e.* during the period in which the full stomach is mechanically reducing its contents to chyme and in which the duodenum is emulsifying the material it receives with the aid of rapidly discharged gall bladder bile. The symptoms may be attributed to inco-ordination of these three organs, produced chiefly perhaps by the deficient amount of bile mixed with the chyme in the duodenum. The fibrous inelastic gall bladder fails to eject adequate amounts of bile in response to the sudden demand. This leads to abnormal activity in the duodenum with antiperistalsis, pylorospasm, and relaxation of the fundus of the stomach. The clinical manifestations of this chain of events are a feeling of uncomfortable fulness after meals,

belching, and sour regurgitations. These are especially prone to occur when the food is of such a character as to demand much motor activity, *i.e.*, when meals are large, when they contain raw food, such as fruits and salads, when much rich sweet food is taken rapidly, and especially when they include much fat. Moreover, they occur soon after the meal is eaten—during the first hour. These symptoms are chronic, usually daily, and tend to have exacerbations.

**Case I**—A young housewife, aged thirty six, who had had three normal pregnancies and three miscarriages, complained of indigestion for two years. This consisted of bloating after meals, belching of gas from thirty minutes to an hour and a half after meals. This was made worse by meats, pastries, and hot bread. During the last nine months it has been much improved because of dieting. She has reduced her weight from 174 pounds, which was obese for her, to 157 pounds. She has had three "bilious attacks" during which she became nauseated and vomited greenish colored material. She felt much relieved after vomiting. She has also had pain below the right costal margin and also in the right lower quadrant. She has never been grossly jaundiced and has had no true attacks of biliary colic. Physical examination is negative except for definite tenderness in the right upper quadrant. Operation found a gall bladder somewhat thickened and irregular, no stones in ducts or bladder. A band of adhesions from the gall bladder near the proximal end to the colon, and another from the phrenic surface of the liver to the diaphragm. Cholecystectomy and appendectomy were done. Pathologic report was of chronic fibrous cholecystitis. In this case one wonders if rigid dietetic control might not have led to a subsidence of inflammation and a cure without operation.

#### CHOLECYSTITIS PRODUCING DAILY EPIGASTRIC DISTRESS

The patient may complain of dull aching pain in the right upper abdomen. This, however, does not appear regularly some hours after meals, as does ulcer pain, but during or shortly after meals, seeming to be elicited by various types of food—

taken as positive evidence of gall bladder disease Cholecystectomy was done. The notes at operation are 'An enlarged and distended gall bladder with a patent cystic duct. The gall-bladder contained one small stone. Common duct was found to be clear of obstruction. The liver showed a moderately advanced generalized chronic hepatitis. Pathologic report Marked chronic fibrous cholecystitis. During the two weeks following operation he had three of the mild attacks of acute hepatitis previously described. He was then put on a diet as nearly fat free as possible and during the next eight weeks had no attacks. He gained 15 pounds during this period on the low fat diet from 84 to 99 pounds.

#### DIAGNOSIS

A The diagnosis of chronic cholecystitis is to be made upon a history bearing the characteristics emphasized in these cases dyspepsia pain and fever usually there is a story of crises—acute attacks of biliaryness in which the dyspepsia becomes nausea and vomiting the dull ache a severe grinding pain, and chills occur with the fever. Of the dyspepsia Hartman writes 'Dyspepsia characterized by accumulations of gas in the upper abdomen belching and sour regurgitation occurring quite promptly after a hearty or indigestible meal or after the ingestion of some specific food such as raw apples cabbage or greasy food is quite as characteristic of cholecystitis as typical gall stone calcification of gall stones. If, in addition there is a local tenderness the diagnosis is better established.

B The diagnosis is further supported by observation of the patient during one of the attacks of acute disturbance so common in these cases. At this time evidence of liver involvement as shown by the van den Bergh test and also by urobilinogen in the urine localizes the pathology producing the obscure syndrome. Visible icterus is not regular during these attacks but latent jaundice is exceedingly common. This is now discoverable by the van den Bergh blood bilirubin estimation. This will quantitatively estimate the bilirubin in the blood in milligrams per hundred cubic centimeters of blood (McNee, Peabody). The

normal bilirubin blood level is from 0.1 to 0.7 milligram per 100 c.c. of blood. This amount does not of course produce visible icterus and it is not until 2.5 milligrams per 100 c.c. is present that icterus appears and bile occurs in the urine. A flare-up of cholecystitis may present no obvious jaundice, but the blood bilirubin may be at 1 or 1.5 milligrams *i.e.*, "latent jaundice," indicating that the attack is associated with hepatic disorder.

Urobilinogen is occasionally present in abnormal amounts in the urine in cases of cholecystitis, and is probably constantly increased during the recrudescences especially when any considerable degree of hepatitis is present, as is shown in the third illustrative case. A very simple test for it is the addition to the urine of Ehrlich's reagent, 2 per cent paradimethylaminobenzaldehyde in 20 per cent hydrochloric acid, as first devised by Neubauer and recently recommended by Wallace and Diamond. A red color develops which may be roughly quantitated by dilution of the urine.

Urobilinogen indicates faulty excretory function of hepatic parenchyma. Its occurrence in the urine during these attacks indicates the frequency of general hepatic involvement associated with cholecystitis.

C Cholecystography now gives most valuable aid in the diagnosis of cholecystitis. It may be relied on to show (*a*) gall stones, and (*b*) inability of the gall bladder to produce the x-ray shadow. These two points are simple and obvious. The other variations from the normal—*i.e.*, (*c*) changes in shape of the shadow, (*d*) apparent deficient density of the shadow as compared with a supposed normal density, and (*e*) delayed emptying—as shown by delayed diminution in size of the shadow, in response to a fat meal, these are diagnostic readings for which normal criteria are as yet not established. And it is unwise to operate merely because of apparent deformity or apparent thinness of the shadow, or delayed emptying time. Indeed, there is great danger that much unconsidered surgery will follow the widespread use of this excellent new diagnostic method. It should be emphasized that mere shadow phenomena should never form the sole basis for clinical judgment. Just as many shadow

deformities of the duodenum are the result of long quiescent conditions in which operation is not even suggested just as many cases of delayed emptying of the stomach are spasmodic and temporary just as all x ray changes in the gastro intestinal tract must be interpreted by history physical findings stomach analysis and stool examination even so these gall bladder shadows must be read in the light of gastroduodenal symptoms the presence of infection the evidence of liver damage and emphatically in the light of the result of dietary management It is these later findings which form the essential basis for correct decisions

#### ESSENTIALS OF MEDICAL MANAGEMENT

Medical management—chiefly dietetic—should be tried over a period of several weeks on all cases associated with dyspepsia and pain in which there is no evidence of serious infection or hepatitis. The diet should be fat free all meat fats cream butter oils yolks of eggs and cheese are omitted. Milk should be skimmed. Ice cream is not given. Meals should be small in bulk and of such physical nature as to demand little motor activity of the stomach and duodenum that is coarse vegetables should be avoided and such as are used should be very thoroughly cooked and puréed. Raw fruits are eliminated. Small amounts of well cooked tender meat are allowed. If there is obesity present the caloric intake should be greatly cut down to reduce the patient's weight rapidly. In many cases this is all that is necessary to relieve the symptoms. The marked effect of diet on cholecystitis and hepatitis is well illustrated in the third case described. In other cases a condition of continuous dyspepsia in obese patients has been permanently checked without operation by a low fat low caloric digestible diet. It is probable that all cases in which the infectious process is not too generalized in the liver or too advanced in the gall bladder should be treated medically (Mayo).

Theoretically in these cases in which the infectious process is mild this dietetic management reduces the cholesterol content of the bile and reduces the motor demands on the gall bladder and

leads to a condition of physiologic rest during which inflammation subsides. It does not seem rational to attempt to drain the gall-bladder by placing magnesium sulphate in the duodenum, since we now know with the aid of cholecystography that a meal will empty it just as well. An attempt, therefore, to reduce the amount of cholesterol in the bile and to decrease the demand for bile itself, with consequent reduction of irritation and physiologic activity, seems more efficacious. It has always been thought that since cholecystitis was due to a sluggish gall bladder that to cure the inflammation emptying it by increased activity was indicated. If this is not to be done surgically the inflammatory process will do best under rest.

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## BILIARY DISEASE FROM THE X RAY VIEWPOINT

DR. EDWARD S. BLAINE

DURING the past year considerable progress has been made in the field of roentgenology in the special work of gall bladder investigation. That which appeared to be of academic interest not very long ago has now been proved to be of practical every-day value in gall bladder studies. The referring physician now can depend on x ray interpretations which will be found correct in a very high percentage of the cases which are subjected to this newer diagnostic procedure.

Until recently the roentgenologist was limited to what has been termed (a) direct and (b) indirect x ray signs of the pathologic gall bladder. The normal gall bladder is believed by many not to give an x ray shadow, although this is doubted by others whose experience in this work warrants consideration. Direct or primary evidence of a diseased organ consists of the shadow visualization of the gall bladder outline or of the shadow of gall stones which are more or less opaque to the x ray. Brilliant results are obtained in such cases as have unusual increases of tissue densities of the gall bladder which provide a contrast differentiation from the structures surrounding the organ, and in many cases the chemical constituents of gall stones are such that clear and unmistakable shadows appeared even on films that were far from correct in exposure technic. But far too many diseased gall bladders and too many gall stones are not so constituted and thus they lack x ray absorptive qualities and result in the well known numerous failures to roentgenologically demonstrate the presence of such pathology. As a natural reaction the referring physician and surgeon could not place much dependence on the x ray report particularly when no unusual shadows were found, his interest in the method being sporadically revived when an occasional direct gall stone shadow or perhaps the gall bladder outline was obtained. The indirect or secondary evidence consists of the detection of displacement effects on the pyloric end of the stomach during x ray study of the gastric ventricle with the aid of an opaque meal or on the shadows of

the duodenal bulb, the villous portions of the duodenum the hepatic flexure of the colon, and other x ray visible structures in the right upper quadrant. Here, too, disappointments await those who place too much reliance on this as a sign of a diseased gall bladder. The percentage of correct gall bladder interpretations seems to vary in direct proportion to the skill of the roentgenologist as a guesser. The so called "gall bladder seat" a crescentic indentation of the duodenal bulb shadow is regarded in certain quarters as pathognomonic of an enlarged gall bladder and therefore pathologic, but this, too, is often found at the operating table to have occurred in the presence of a macroscopically normal organ. The prognathian configuration of the barium filled stomach which frequently is caused by perigastric and peri duodenal adhesions the result of gall bladder inflammation also is considered by some as a secondary sign of gall bladder disease but this too, is often found not to be the case when the abdomen is opened the surgeon reporting a normal gall bladder.

It is quite true that a large amount of x ray gall bladder work done the country over is of inferior quality and therefore it is unfair to regard many of the failures as due to the method *per se*. It is equally true that many apparently normal gall bladders seen by the surgeon at time of operation are later found to be diseased when their tissues are examined microscopically. Careful and thorough x ray technic would unquestionably result in a greater number of correct interpretations in gall bladder diagnosis. In other words, technically perfect x ray films are an absolute necessity in order to obtain the maximum diagnostic value from this procedure. This has been stressed by George and Leonard in their splendid work on the gall bladder, and explains in large part the unusually high percentage of correct x ray diagnoses they have made which were operatively proved.

To the direct and indirect x ray signs of the gall bladder condition we now have added the Graham test. Graham and his several co workers (Cole, Copher, and Moore) have developed a method of obtaining shadows of the gall bladder such as are not possible by any other means. This test consists of the intravenous injection (or oral administration) of the sodium salt

of tetraiodophenolphthalein a dye which is excreted by the liver and concentrated in the gall bladder. This material is opaque to x ray and when it fills the gall bladder ventricle a shadow of considerable density results on the x ray film. This shadow provides a means of estimating the size shape position and activity of the gall bladder from which pathologic deductions may be made.

With this method the roentgenologist is no longer confined to the detection of gall stones but now can make determinations which will indicate whether a given gall bladder itself be normal or abnormal and x ray examinations of the gall bladder have increased in value both for the patient and the referring physician.

The technic of the ordinary x ray examination of the gall bladder consists of a preliminary preparation of the patient by a purge preferably taking a cathartic which will result in the least amount of residual intestinal gas. Castor oil is probably the best for this purpose. Fasting for twelve to eighteen hours prior to the x ray exposures is a necessity and the patient should partake of an evening meal which has a high fat content on the day preceding the examination. This is of value in emptying the gall bladder of its contents. In the regular x ray examination of the gall bladder the patient is placed prone and the central x ray is directed from above downward through the patient's back on the right side of the spine in the angle formed by the twelfth rib and upper lumbar vertebrae. Pfahler advocates bending the spine toward the right by raising the right shoulder and increasing the normal lordosis by placing pillows under the chest and pelvis which serves to push the gall bladder downward from under the liver. This is done to avoid as far as possible the interference caused by the liver which is a large heavy and relatively dense organ. However this is not a necessity for successful gall bladder exposures particularly when the Potter-Bucky moving grid is employed. The advent of this apparatus has opened up the field of x ray demonstration of anatomic parts of densities which formerly escaped shadow detection. The best results in gall bladder studies are obtained by the use of this accessory.

One of the prime rules in roentgenology is that any given shadow must be present in more than one film of the same area in order to represent a lesion and not an artifact or other error. Thus it is necessary to make several exposures of any region that is under consideration. This is particularly true in studies of the urinary tract, but it is proper to make an exception in gall bladder investigations with reference to stone shadows. Of six or more exposures of this area, only one or two of the films may show the shadow of a stone or stones, while the remaining exposures may contain no such evidence. This may be due to one or more causes, such as failure of patient to remain absolutely quiet during the exposures and variation of degree of penetration of x ray and variation in development of films. Extensive studies made by several investigators as to the x ray shadows produced by gall stones of all kinds indicates that each type of stone has an optimum shadow in terms of x ray quality as to soft, medium or hard rays. Even the most skilful examiner does not know the exact chemical composition of the stones in any case and, therefore, several exposures at various degrees of x ray hardness should be made. George and Leonard accomplish this by making a preliminary or try out exposure at a certain quality, and then develop the resulting film immediately, leaving the patient in position. As soon as the hypo has cleared the film an estimate is made as to what changes in the quality of the x ray shall be made in the succeeding exposures. In this manner they obtain gall stone shadows which would most often not register on the film if one degree of hardness only be used, as is so universally done. At least six satisfactory x ray films of the gall bladder should be made in each case, and these should be large enough to include a rather wide area around the gall bladder because this organ may be found in abnormal positions. I have found the gall bladder fundus to be several centimeters below the iliac crest in some cases, above the shadow of the tenth rib in others, and even to the left of the spinal vertebrae. Thus the size of film should be at least 10 by 12 inches. A cone of sufficient size to completely cover this size of film undoubtedly enhances the shadow values. Suspended breathing is so important and so

necessary that the patient should be impressed with the fact that success or failure depends on his or her co operation, and this is assisted by a practice period before the actual exposure. Neither a deep inspiration or deep expiration is advisable. A suspension of the respiratory act in the position most comfortable for the patient is best. The slightest movement will result in failure to obtain shadows of many gall stones of low grade density.

In addition to the five or six postero-anterior exposures already described, Knox advises a lateral projection in such cases as it may be necessary to differentiate between the shadows of stone in the right kidney and a cholelithiasis. This consists of a lateral projection with patient on the right side, which serves to place the suspected shadows in the anterior portion if gall stones, and in the posterior portion if renal stones. Calcified costal cartilages sometimes are confusing on the x ray film, but this lateral view also enables the roentgenologist to distinguish them from gall stones.

The typical gall stone shadow is one which presents a denser periphery but some stones are seemingly solid and of even density throughout. When a single stone is present and when multiple stones do not lie in direct contact, or when the contact surfaces are at right angles to the central x ray, the resulting shadow is of circular or ring formation, when multiple stones lie in direct contact the result is a flattening of the contact surfaces. Various outlines of the individual stones are seen, such as triangular, square, or rhomboidal figures. The development of a gall stone as to chemical make up sometimes is an uninterrupted process of accretion but many of them show evidences of periods of change in growth noted by a lamination indicating a variation in the chemistry of its evolution.

Gall-stones have been classified by Roberts as given by George and Leonard in six groups viz:

1. The *radial cholesterolin stone*, which is of less density than the surrounding tissues gives a decreased shadow density. It is rare and its pure cholesterol crystals radiate from a center outward in several directions.

## BILIARY DISEASE FROM X RAY VIEWPOINT

2 The *combination stone*, in which a cholesterol stone requires a peripheral deposit of lime salts, resulting in a triangular or ring like shadow increase which sometimes are partial rings or segmented figures

3 *Cholesterol bilirubin Calcium Stones*—These are usually multiple and faceted, with an even distribution of calcium thus presenting solid shadows. These are difficult to shadow because of low calcium content, but are a common type of stone.

4 *Common Multiple Faceted Stones*—Most frequent of stones, usually multiple (sometimes hundreds of very small stones packed in the gall bladder). These are most often easy to visualize because of contrast of the calcium layer on the peripheries. At times a mottled or mosaic appearance results from this type of stone and are spoken of as "negative densities" i.e. less than the shadow of the tissues of the neighbor. About 50 per cent of gall stones are of this classification.

5 *Pure bilirubin lime stones* when of small size are easy to see, but at times are of sufficient size to be plainly obscured.

6 *Calcium bilirubinate stones* occur single and are very rare, thus being easy to recognize on x ray shadow, but these stones constitute about 5 per cent of all gall stones.

### THE GRAHAM METHOD

The technic of this method varies according to whether the material used to visualize the gall bladder be given intravenously or by mouth. Of these two forms, the intravenous injection is superior as to diagnostic accuracy, while the oral administration is easier to give.

The intravenous injection as performed by Graham consists of giving by syringe two injections of the sodium salt of iodophenolphthalein at a half hour interval, the total amount being 5 grams of the dye in 40 c.c. of distilled water, sterilized in a boiling water bath for fifteen to twenty minutes.

A modification of Graham's original technic has been made by my associate, Dr. J. J. Moore, and myself, which we find superior results and is less trying to the patient. The pa-

is instructed to take an evening meal on the day preceding the examination high in fat content. No breakfast is taken on the day of the examination and at 9 A.M. preliminary exposures of the gall bladder area are made. Then the patient is prepared for injection by the gravity method. Two graduated cylinders are used each of 150 c.c. capacity one containing normal salt solution the other containing 3.5 grams of iodine in 100 c.c. of sterile water. This was previously boiled for thirty minutes in a water bath. Both solutions lead to a union two way valve. The fluid level must not be more than 28 inches above the height of the needle. The patient lies recumbent and the needle is inserted in any of the prominent veins of the anterior aspect of the elbow. After the needle is inserted a few c.c. of normal salt solution is allowed to flow thus insuring the correct intravenous position of the needle. On ascertaining this to be correct the two way valve is turned to permit the dye to enter which flows slowly and occupies upward of thirty minutes for the entire amount (100 c.c.) to enter the vein. Then the valve is again reversed and a few c.c. of the saline flows into the vein as a wash. The patient reclines for a period of three hours until noon when the second exposures are made. No luncheon or other food is permitted. The patient may leave the laboratory and is permitted to perform any ordinary pursuits and returns four and a half to five hours later for a third series of exposures. Regular diet is then allowed. Breakfast the following morning containing a cereal with considerable cream is advised and the patient returns to the laboratory for the final exposures twenty-four hours after injection. With this technic we have had no reactions other than a few cases of transitory disturbances such as headache, dizziness and slight nausea for a brief period and a still smaller number of cases (women only) in which vomiting occurred. Several physicians have undergone this procedure and they report no unusual symptoms therefrom.

#### ORAL ADMINISTRATION

Because of accidents of technic in the intravenous injection and the inexperience of the average roentgenologist with such

procedures, and also because of an assumption that reactions on the part of the patient are due to the injection *per se* many prefer the less reliable and less exacting technic of giving the tetrabromphenolphthalein by mouth. It can be obtained in several coatings in pill or capsule form. The desired effect is only obtained if none of the pills open in the stomach and all of them dissolve in the small bowel. Such pills as go through the alimentary canal undissolved are a loss and a deterrent to accurate results. Those which open in the stomach cause a very ill patient. The examination takes much more time than does the intravenous method. The work of Whitaker, Milliken and Vast and that of Menees and Robinson demonstrated that the dye could be successfully given by mouth. Levyn and Aaron have reported satisfactory results with the following technic. Two days preceding the x ray exposures the patient takes 2 ounce of castor oil in the evening. The following day a light diet is ordered and an evening meal consisting of a cereal toast or tea is given. One hour later, 3 capsules, each containing an inner capsule of 0.25 gram of the dye, surrounded by dilute

ance whether by intravenous or oral administration of the dye. At certain hours the shadow has a certain degree of density and is empty at certain hours. By the intravenous method the material immediately begins to pass through the liver, and in three hours a quantity sufficient to fill the gall bladder and give a moderately dense shadow is present in the ventricle; in eight hours the physiologic action of the organ has concentrated the opaque material to such a degree that the shadow is very dense and of diffuse character; in twenty four hours the gall bladder has delivered the dye into the duodenum and, therefore, a complete disappearance of the shadow is noted. With the oral method the dye does not appear in the gall bladder for several hours and it does not clear the gall bladder as soon as by the intravenous method.

The diseased gall bladder will present a disturbance of this sequence of shadows due to intrinsic changes in the mucosa or in the walls of the organ which result in altered motility or a variation in the outline of the gall bladder lumen, or both. A failure of shadow may be due to any of the following causes:

- 1 An insufficient liver
- 2 An obstructed duct either from calculi or inflammation, in or about the gall bladder
- 3 A failure to concentrate bile due to (a) non functioning cystic mucosa (b) non functioning lymphatic system

All cases in which this test corresponds with normal shadow features is termed a Graham negative and if otherwise is a Graham positive.

The Graham method has been the means of increasing the percentage of stones shown by the x ray due probably to chemical changes between the dye and a soft outer surface of certain stones. This is evident by the occurrence of stone shadows (not previously visible) after the dye has left the gall bladder. Cholesterin stones present a very striking shadow appearance due to the local absence of shadow because of the displacement of the opaque material by the stone, and this is spoken of as a "negative density stone" in the x ray report. In gall bladders filled with small stones a mottled appearance of the visualized organ

is noted a single stone shows an incomplete filling of the dye due to displacement

The Graham method intravenously will be found to be correct in more than 90 per cent of cases which go to operation. The oral administration in the hands of many is less reliable and a lower percentage of correct inferences has been obtained. This is in accordance with Graham's own results with the two methods as recently stated by him. Recently I encountered a case in which two distinct gall bladder shadows overlapped each other on all of the several exposures which evidently represents a rare anomaly of double gall bladder similar to that reported by Nichols except that this case was recognized by two rows of gall stones and not by the Graham method.

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#### BILIARY DISEASE FROM THE SURGICAL STANDPOINT

DR R W McNEALY

MORE satisfactory results will be obtained in gall bladder surgery when our knowledge is such that we may properly apply the fundamental principles which are destined to crystallize from the vast amount of clinical and experimental work now in progress. We are handicapped in this transitional stage by conflicting reports and meager knowledge of the physiologic and pathologic processes of the entire biliary system.

Embryologically the gall bladder bile ducts and liver represent an outpouching from the upper portion of the gastrointestinal tract or primary enteron. Therefore there naturally exists a close relationship between these organs and their interactivities may in a large way account for the interdependency of their pathologic activities. We can no longer discuss gall bladder disease as an isolated condition but must take into account the condition of the liver and neighboring organs. Let us then briefly review some of the important physiologic problems of the biliary system which have recently received considerable attention.

The importance of the liver in carbohydrate metabolism has

long been established. The work of Mann<sup>1</sup> seems to show that after total loss of the liver the animal completely loses its ability to regulate the level of blood sugar even though there is an abundance of glycogen in the muscles. The prompt administration of glucose is necessary to avoid death from a hypoglycemia. In associated involvement of the liver in biliary tract disease we must realize that it is an organ with a large factor of safety since it has been shown by Mann that following the removal of 80 to 85 per cent of the liver the remnant will still suffice for normal function.

The relationship of the liver to bile formation has only recently been clarified.<sup>2</sup> Whipple and Hooper<sup>3</sup> demonstrated the formation of bile pigment in animals after the hepatic circulation had been diminished by an Eck fistula. Mann<sup>4</sup> has called attention to the formation of bile pigments in hepatectomized animals. The source of bilirubin is the hemoglobin set free during the normal destruction of blood within the body.<sup>5</sup> Aschoff<sup>6</sup> has suggested that this transformation takes place in the reticulo-endothelial system widely distributed throughout the body in the endothelial cells of the spleen, bone marrow and lymph glands and the Kupffer cells of the liver. The normal pathway of excretion of bilirubin is by way of the hepatic cells. On the basis of this knowledge of bilirubin metabolism McNee<sup>7</sup> has given us a new conception of jaundice which correlates the clinical and experimental data. According to him jaundice may be produced as follows:

1 Bile pigment passes through the liver cells but meets obstruction and is absorbed by the blood. This corresponds to the obstructive type of jaundice.

2 An excessive destruction of red cells leads to an accumulation of pigment in the blood due to an inability of the liver cells to remove the pigment rapidly enough. This corresponds to the hemolytic type of jaundice.

3 When liver cells are damaged the bile pigment enters the cells to be excreted. The bilirubin is absorbed by the blood. This corresponds to the toxic or infective type of jaundice.

The bile salts or bile acids appear to be synthesized in the liver, hence they are true secretory products of liver activity.<sup>8</sup>

In the light of what is known of liver function the value of certain liver function tests becomes apparent. Some are based on functions of the liver that are not well known or not exclusive for this organ. Among these may be mentioned the levulose test, blood urea test, and hemoclastic crisis of Widal. Others are based purely on the excretory function of this organ. Among these may be mentioned all of the dye tests.<sup>9-14</sup>

Van den Bergh<sup>15</sup> has given a relatively simple test for the detection of bilirubin in the blood serum. This is a modification of the Ehrlich diazo reaction, and is at present one of the most delicate tests for this substance. It consists in the addition of Ehrlich's diazo reagent to blood serum. In the presence of jaundice of the obstructive type a purple color appears immediately. This is called the "direct" reaction. In hemolytic jaundice the color appears slowly. This is called the "indirect" reaction. The addition of alcohol produces a rose colored azobilirubin which can be tested colorimetrically and the amount in the circulating blood calculated. Normally there is 1 to 3 mg of bilirubin per liter of blood, or, on the basis of 5 mg per liter as one unit there are from 0.2 to 0.6 units. This corresponds to a dilution of 1:500,000 to 1:600,000. When jaundice is manifest the concentration is from 1:50,000 to 1:60,000. The hyperbilirubinemia present before jaundice appears has been called by Barrow et al.<sup>16</sup> latent jaundice.

Greene<sup>17</sup> adequately summarizes liver function tests in stating that the various functional tests contribute but little from the standpoint of the differential diagnosis of hepatic diseases. Disturbance in one type of physiologic activity does not necessarily indicate commensurate disturbance in other functions of the liver. The presence of a normal amount of bilirubin in the serum and the absence of dye retention will not exclude hepatic disease. This indicates the necessity in the functional study of the liver of employing a diversity of tests that will include the multiple activities of this organ.

The function of the gall bladder is still under discussion. Its

presence in some animals and its absence in others has brought forth the statement that it is a vestigeal organ similar to the appendix and is not essential to the normal activities of the body. Its presence however subjects it to the possibility of disease which requires our attention. Normally the gall bladder concentrates and stores bile and adds mucus to it. Under certain conditions as in obstruction to the cystic duct the gall bladder may absorb bile while still secreting mucus giving rise to the condition known as hydrops of the gall bladder.

Gall stones may be cholesterol alone or of varying amounts of this substance with bilirubin calcium and bile salts. They may form when the cholesterol content of the blood is high since the excess of cholesterol in the blood is excreted by the liver or they may form when excessive concentration of bile occurs as associated with infections of the gall bladder.<sup>18</sup>

The incidence of demonstrable infections in pathologic gall bladders removed at operation has been reported recently to be in the neighborhood of 25 per cent. Thus low percentage of proved infections makes it necessary to seek other causes for the pathology of the gall bladder. Mann<sup>19</sup> has shown that the liver has a particular affinity for chlorins. Injection of 5 to 10 c.c. of Carrel Dakin solution per kilo of body weight acts on the gall bladder and does not injure any other tissue unless a sufficient amount is used to destroy the animal. Repeated injections will seriously injure the viscera perhaps due to the high concentration of chlorins obtained in the gall bladder by the absorption of water in this organ. This experiment is exceedingly interesting and future work may give this chemical origin of gall bladder pathology a more prominent place than it has heretofore occupied.

Infection of the gall bladder may be due to (1) spread of infection from the duodenum through the common and cystic ducts (2) passage of infected material from the liver through the hepatic and cystic ducts (3) blood borne infection and (4) lymph borne infection from neighboring or more remote pathology. While the former two factors may account for infection of the gall bladder contents the latter two are the most probable.

etiological factors in infection of the gall bladder itself Graham<sup>20</sup> has shown that infected gall bladders show a round cell infiltration in the deeper tissues of the gall bladder wall especially in the subserous layers This is usually associated with a pericholangitis within the liver substance Absorption of infectious material from organs drained by the portal vein may infect the liver which, in turn, will infect the gall bladder The anatomic relationship of the lymphatics of the gall bladder with those of the liver accounts for this mutual infection A free anastomosis exists between the lymphatics of the duodenum, pancreas gall bladder, and liver, hence any infectious process in one may be associated with an infectious process in the other

Infected gall bladders may require surgical therapy for relief of symptoms The time of operation and nature of operation depend not alone upon the local pathology but also upon the general condition of the patient Acute fulminating conditions require treatment without any special preparation of the patient other than that which can be done immediately It has been the usual practice to treat the very acute cholecystitis cases expectantly if possible, until the temperature has subsided and the crisis is passed In this respect the gall bladder is not comparable to the appendix We must bear in mind, however that empyema gangrene, and even rupture may occur in these cases carried along on expectant treatment There seems to be no reliable guide to a correct selection of those cases in which operation may be delayed

In jaundiced cases there has occurred a decided improvement in the method of determining the operability of these patients and a still further improvement has taken place in the preoperative therapeutic management which has served to decrease the operative morbidity and mortality<sup>21</sup> The *van den Bergh* test may point out the advisability of delaying an operation when it is shown that the icterus index is increasing Walters<sup>22</sup> has shown the efficiency of the injection of calcium chloride solutions intravenously in shortening the coagulation time of blood Blood transfusion has also been of value as a preoperative measure to favor the clotting time and combat an existing anemia

In chronic gall bladder disease we have a most important field for the application of the van den Bergh bilirubinemia test. It is in these cases that one may many times demonstrate the presence of latent jaundice when other signs and symptoms may be confusing or suggest pathology in some other organ.

In the preoperative preparation of patients with chronic gall bladder disease one should not neglect the liberal administration of fluids for the purpose of promoting elimination. A high caloric carbohydrate diet with a diminution of protein intake should be routine.

In view of the recent investigations one is inclined to believe that cholecystectomy will have a narrower field of application than it has occupied in the last five years. While attention has been repeatedly drawn to the frequency of appendicitis occurring concomitantly with cholecystitis other pathologic conditions in the duodenum, pancreas and portal area have not received sufficient consideration. The presence of a duodenal ulcer has been demonstrated in a considerable number of cases in which a primary operation of cholecystectomy and appendectomy failed to give relief of what appeared to be typical symptoms of biliary tract disease. Theoretically one should find little to support cholecystectomy in the presence of associated pathology of the bile ducts, liver, duodenum and possibly pancreas unless the gall bladder exhibits such evident pathology that it may be considered functionless or even a menace.

The question of drainage following cholecystectomy or operations on the common duct has been much discussed during the last few years.

While some have advocated closure without drainage, most operators feel a certain safety in providing a small rubber tissue wick to the site of operation.

The postoperative management of gall-bladder disease should receive the same careful attention that is being accorded peptic ulcers and goiters. There can be little question in the minds of those who have given much thought to biliary tract disease that operation in itself is often only a small factor in the therapeutic management of these patients. Probably nowhere

else in surgery is the co operation of a skilled internist more helpful than in these bizarre clinical and pathologic pictures

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## CLINIC OF DR FREDERICK CHRISTOPHER

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### MULTIPLE SUPPURATIVE ARTHRITIS IN A BOY OF ELEVEN

On the day previous to admission the patient, Robert G., played football in the morning and came home for his Thanksgiving dinner with a slight limp. He ate heartily however. In the afternoon the limp became more marked and there was pain in the right hip. The temperature was then 100° F. The pain became increasingly severe during the night. In the morning the child was nauseated and the temperature was 102° F. The patient was seen by a pediatrician Dr C A Aldrich, who, fearing an osteomyelitis, called the writer in consultation. On examination it was ascertained that motions of the right hip joint were markedly limited and extremely painful. Dr Aldrich noted a "red throat," a systolic murmur (probably functional) over the cardiac area and moderate tenderness over the extreme lower abdomen on the right side. The patient was taken to the Evanston Hospital 11/27/1925 and traction applied to the right leg. Despite the traction and generous doses of morphin and codein, the child suffered a great deal during the night. In the morning the temperature was 103 4° F. pulse 120 respirations 28. The white blood count was 16 400 and the urine was negative. The x ray of the right hip was negative. The patient was seen by Dr L L McArthur and by Dr Aldrich in consultation. Dr McArthur felt that it would be an injustice to omit an exploratory laparotomy because of the likelihood of the patient's symptoms being explained by a gangrenous appendix situated on the psoas muscle as to cause pain on motions of the hip. Operation 11 28/25 (I C) The subcutaneous tissues, as seen

through the McBurney incision were watery and edematous but there was no evidence of pus. An appendix which showed but slight chronic catarrhal inflammation (Pathologist Dr J L Williams) was removed. The patient tolerated the operation well, but the pain in the hip continued. The next day (11/29/25) a blood culture was made. This was positive for Staphylococcus albus. On this day the patient was seen in consultation by Dr Isaac A Abt. Late this day the patient began to complain of pain in the right knee. The temperature ranged about 102° F. On 12/2/25 the right knee joint had become distended and was painful. Aspiration of the knee joint disclosed pus which when cultured gave aerobic and anaerobic, hemolytic and non hemolytic Gram positive cocci (Staphylococcus albus). An arthrotomy of the right knee joint through bilateral longitudinal incisions done this day. On the next day the patient was very irritable and began to complain of pain in the left hip. The temperature was 103° F. Numerous doses of morphin, codein aspirin and sodium bromid were necessary to control the pain. On 12/4/25 the leukocyte count was 21,300 and the temperature reached 104° F. Dr Aldrich noted a few rales in the right lower chest posteriorly. On removing stitches from the appendectomy incision a quantity of pus escaped from the underlying subcutaneous tissues. Cultures of this pus showed hemolytic Staphylococcus albus. The pain in the left hip had now become so severe that the patient was taken to the operating room and anesthetized. By means of a long needle the left hip was aspirated and pus obtained. Culture of this pus showed the organism to be a hemolytic Staphylococcus albus. Leaving the needle in place a longitudinal incision was made above the great trochanter and deepened through capsule of the hip joint so that the articular surface of the head of the femur came to view. A small quantity of pus came from the hip joint. Cultures of this pus also gave a hemolytic staphylococcus. A small rubber drainage-tube was sutured to the joint capsule. On 12/5/25 there was a painful area at the left elbow at the site of a hypodermic wound. This area did not break down to suppuration. The arthrotomy incision of the left hip drained thick pus. The

affected joints were moved passively from time to time on the Willems theory of prevention of ankylosis. On 12/6/25 a vaccine made from organisms obtained from knee-joint culture and blood-cultures was started. During the week (from 12/7/25 to 12/14/25) the patient coughed considerably despite benzoin inhalations and other treatment. Cultures of the sputum showed a hemolytic staphylococcus and other organisms. X-Ray examinations of the chest on 12/14/25 and 12/17/25 gave evidence which pointed to the formation of an abscess in the base of right lung. The localized chest findings persisted for several weeks and gradually subsided. The arthrotomy of the left hip was irrigated daily with mercurochrome solution and the discharge diminished. On 12/17/25 the roentgenologic examination of the left hip (Dr. E. L. Jenkinson) showed the articular surfaces to be irregular and rarefied. The articular space was narrowed probably from destruction of the cartilage. Previous to this time there had been about 8 pounds traction on the left leg. The pain, at the slightest motion of the left hip-joint, became so severe that on 12/18/25 a plaster hip spica was applied under anesthesia. This gave the patient a great deal of relief from pain. The temperature now ranged from normal to 101° F., but fell gradually to maximum of 99.2° F. on 12/28/25. The white blood-count on 12/27/25 was 10,600. The patient was now so free of pain that on 12/28/25 the plaster spica was removed. This caused some return of pain and an elevation of the temperature maximum to 101° F. From this time on the temperature gradually subsided, the pain became less, and the discharge from the hip wound gradually subsided and finally ceased. On 12/31/25 the x-ray showed destructive areas scattered about the proximal fifth of the femur. On 1/11/1926 the x-ray showed the superior half of the head of the femur to be partially absorbed and the existence of multiple areas of bone necrosis in the neck. On 1/25/26 osteomyelitis definitely involved the right ischium and pubis. There was, however, no clinical evidence of osteomyelitis at this time. On 1/28/26 the patient began to have pain in lower right abdomen just above the symphysis, with radiations to the penis and scrotum. There was an area of

dulness and of tenderness corresponding to the painful area on the abdomen. The temperature rose to 102° F and the white count to 19,300. The urine was negative. Rectal examination negative. On 1/31/26 however the pain was less the temperature maximum was 99.4° F and the leukocytes 9400. The painful dull area rapidly disappeared and the temperature became normal.



Fig 341.—x Ray of both hips showing condition on January 30 1926

and remained so. The joints were moved and the legs massaged. The patient was gathered up on crutches. There was now definite ankylosis of the right hip joint but the position was excellent (No flexion, but very slight abduction of the thigh). The motion in the right knee and hip joints was free and painless. On February 10 1926 seventy five days after admission

the patient was discharged from the Evanston Hospital and sent home in care of a nurse. On March 15, 1926 he had gained 8 pounds in weight and could walk a little without crutches



Fig. 342.—x-Ray of right hip showing condition on March 4, 1926

He had no pain and was in excellent spirits. In July, 1926 the patient was able to play 27 holes of golf. There was slight flexion of the thigh at this time

#### DISCUSSION

Acute suppurative arthritis (sometimes termed "acute epiphysitis" or "acute infectious synovitis") in childhood has been made the subject of an interesting study by Pybus.<sup>1</sup> At any

time, from almost immediately after birth until the end of the period of childhood, pyogenic infections may occur in the joints. The organisms may enter the joints by one or more of three routes (a) They may enter directly into the joint by a wound which involves the latter, or (b) they may enter the joints by extension from adjacent tissues, particularly the bones, or (c) they may enter the joints by way of the blood stream. If the infecting organism proves to be a staphylococcus its origin is usually the adjacent bone. Rarely the staphylococcus may be carried in the blood stream from the skin surface. The streptococcus may be found in a single joint following certain fevers. The gonococcus may be found in the joint following gonorrhoeal ophthalmitis or vaginitis. Pneumococcus arthritis has been known to follow pneumonia. Moore<sup>2</sup> has seen suppurative arthritis following diphtheria and typhoid, and he believes that the majority of cases begin as an osteomyelitis. Willems<sup>3</sup> maintains that the type of infecting organism does not influence the ultimate result in suppurative arthritis, but merely the duration of the disease. The diplococcus arthritis may be cured in several weeks but the staphylococcus arthritis and especially the streptococcus cases last for months. Phemister's<sup>4</sup> very interesting work in 1924 showed that "in pyogenic arthritis articular cartilage is killed and broken down first at the points of contact and pressure of opposing articular surfaces." In the tuberculous arthritis on the other hand, the articular cartilage is not killed first, but is protected at the points of contact and pressure of opposing articular surfaces.<sup>5</sup> The infection of pyogenic arthritis rarely invades secondarily the deeper portions of the bone at the points of pressure.<sup>6</sup> In order of frequency the joints most commonly affected are the hip, the knee, the shoulder, and the elbow. Cooperman<sup>10</sup> observes that "several joints may be involved successively clear up, and then one predisposed joint, which may be the hip, bears the brunt of the infection." Pybus<sup>1</sup> says that in order to make a complete diagnosis one must answer the following questions (1) is the joint infected? (2) what degree of inflammation is present? (3) what is the infecting organism? (4) what is the mode of entry of the infection? Three

portant diagnostic signs<sup>10</sup> are (a) Increase in synovial fluid characteristic position of the joint, (c) limitation of motion due to reflex muscle spasm. The differential diagnosis requires consideration of tuberculosis of the hip, acute inguinal adenitis, acute psoitis, toxic arthritis of the hip, and acute osteomyelitis of the upper end of the femur.<sup>10</sup>

In cases of sudden onset of pain in joints in children complete rest is at once ordered. Weight extension, as suggested by Phemister, is rational and should be tried. If, at the end of from twenty four to forty eight hours the pain is undiminished and worse there is fever and leukocytosis, an exploratory puncture at the joint with needle and aspirating syringe should at once be done. Cooperman<sup>10</sup> recommends the following technic of aspiration: "An ordinary aspirating needle 1.5 mm. in diameter and 9 cm. long is inserted 1 cm. below Poupart's ligament and 1.5 cm. external to the femoral artery. The needle is directed straight backward until it strikes the neck of the femur. By raising the thigh the anterior portion of the capsule is relaxed, which permits easier penetration. The hip joint may also be aspirated by inserting the needle just above the great trochanter and passing it mesially above the upper surface of the neck until the capsule is entered."

If a turbid fluid is obtained on aspiration Pybus<sup>1</sup> recommends leaving the needle *in situ* and the performing of repeated aspirations and the injection of antiseptics. The milder gonococcus and streptococcus cases may occasionally be cured in this manner. Cooperman believes that the gonococcus cases should be immobilized in casts.

If on the other hand, the aspirating needle obtains frank pus arthrotomy should be immediately performed. Early treatment is of great importance.<sup>8</sup> Willems<sup>4</sup> advocates long arthrotomy incisions and immediate active mobilization. This method has been highly successful in many cases.<sup>6, 6, 7</sup> If in cases of osteomyelitis the joint becomes involved, it too should be drained.<sup>2</sup>

Pybus maintains that the whole tendency of present day surgery is to abolish drainage as far as possible. The joint cavity is

thoroughly washed out with an antiseptic solution and if no marked destruction be present the wound may be closed again. If the cartilage be partly destroyed or if some bone focus opens into the joint drainage by means of a tube should be instituted. In a few cases where there is a blood infection and in which the joint condition is almost hopeless amputation may be called for.<sup>1</sup>

In certain cases where ankylosis seems to be unavoidable or where there is a great pain on attempts at mobilization, immobilization in a cast or splint is called for. These cases must be given frequent roentgenologic examinations.

If there be evidence of osteomyelitis in the x ray no operative steps to remedy it need be taken unless there is also clinical evidence.

Where it becomes evident that ankylosis is inevitable the joint should be fixed in the optimum position and weight bearing or use should be avoided until the temperature has been normal for a number of weeks and until the x ray shows strong union. Measures to build up the patient's general health should actively be employed. Ample nourishment and fresh air are, of course, indicated. It is possible that ultraviolet light baths may exert beneficial influence.

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## CLINIC OF DR. LINDON SEED

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### BRANCHIAL CYST

THIS patient, a girl of sixteen years, came to us primarily because of a swelling on the left side of the neck and, in addition to that, because of a loss of weight, shortness of breath, and swelling of the ankles. A swelling appeared in the neck sixteen months ago. It increased rapidly in size and was incised, it recurred, and was incised again four times. There had been a continuous moderate degree of pain, with exacerbation, when the swelling became large. She said she had heart trouble since seven years of age. There was troublesome precordial distress and some swelling of the feet at night. She had lost 9 pounds in weight in three months.

She was a poorly nourished individual. A cyst the size of a hen's egg appeared in front of the sternocleidomastoid at the level of the thyroid cartilage and extending in behind the muscle. It was soft, freely movable, and attached to the skin at the point of previous incisions. There was evidence of organic heart disease, mitral stenosis, with a presystolic murmur and thrill. Hemoglobin 75 per cent., red blood-cells 4,100,000, white blood-cells 7100. Urine was negative, x-ray of the chest negative.

A diagnosis was made of a caseating tuberculous gland. Involvement of the skin with more or less fixation of the glands is characteristic of tuberculosis. There were, however, no other glands enlarged on either side of the neck, and it would be unusual for a single gland to reach such a size with no other evidence of infection. The mass was in the position of a branchial cyst and had the characteristic extension beneath the sternocleidomastoid. A thyroglossal duct cyst is closer to the midline and

does not extend laterally into the deep structures of the neck. A lipoma does not become infected. Cystic hygroma is translucent. A blood tumor can be emptied. A diagnosis is made absolute by aspiration of the cyst and examination of the contents for cholesterol. There is no other treatment for a branchial cyst except complete removal. The patient was prepared for operation by several weeks rest in bed combined with the administration of small doses of tincture of digitalis.

Under local infiltration anesthesia a transverse incision was made over the cyst and the skin flaps dissected for 4 cm. The cyst was opened a yellowish gruel like material escaping and then packed with a gauze sponge. It extended deep into the neck down to the bifurcation of the common carotid and was readily removed by blunt dissection.

Although the contents of these cysts have the gross appearance of pus they are rarely infective and no drainage is necessary.

On histologic examination the cyst consisted of a thick fibrous wall interspersed with lymphatic tissue lined by squamous epithelium which in places showed evidence of subacute inflammation (Fig. 343). Some of these cysts are lined by columnar epithelium or by both columnar and squamous epithelium the majority however are lined by the squamous type. The numerous lymph follicles surrounding the cyst are characteristic of this condition and have been attributed to the origin of the cyst from the thymic anlage. Wengrowski in 1912 presented excellent evidence that branchial cysts and fistulae were vestigial remains of the thymopharyngeal duct arising from the third pharyngeal pouch rather than to remnants or malformations of the branchial clefts. J. E. Frazer is of the opinion that they are remains of the precervical or cervical sinus part of the branchial apparatus. J. E. Thompson believes that ranula branchial cysts and deep cervical cysts are derived from vestigial remains of the branchial clefts that the primary cyst is derived from the cervical sinus and the cyst is carried from its original position by the shifting of muscles during the formation of the neck. Hamilton Bailey has drawn attention to the fact

that branchial cysts have a constant position identical to this one and that they can be divided into four types (1) Those lying just beneath the skin, (2) those extending deeper and attached to the internal jugular, (3) those passing between and straddling the bifurcation of the common carotid, (4) those of the mucous or columnar celled type lying entirely posterior to the common carotid next to the pharynx.

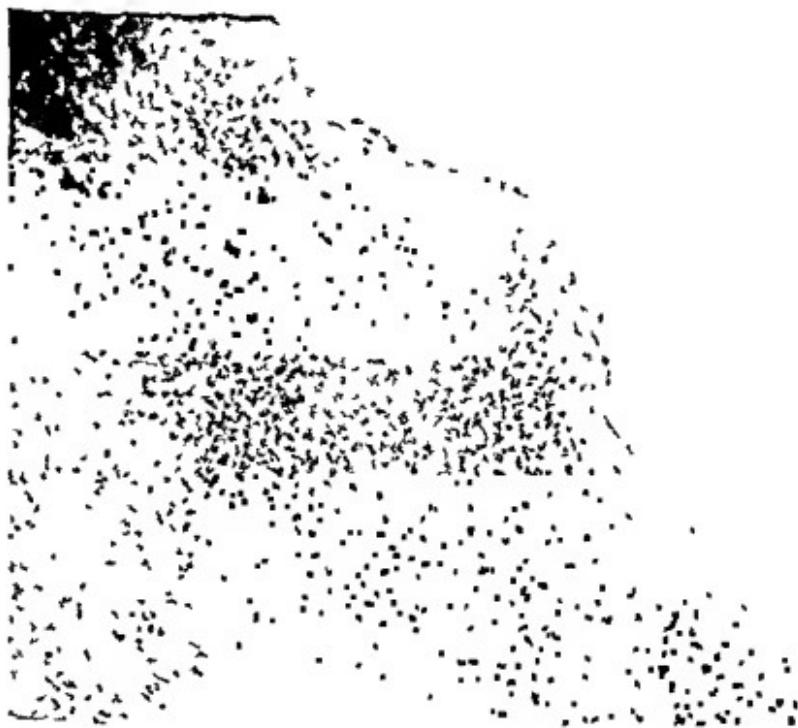


Fig 343.—Wall of branchial cyst. Squamous epithelium with infiltration of lymphocytes as well as a few polymorphic leukocytes

There are a few reports of carcinoma arising in these vestigial remnants. Definite proof is extremely difficult. We have a patient in whom we removed a large mass in the side of the neck that proved to be a squamous-cell carcinoma. He has been examined carefully several times in the past six months for evidence of a primary malignancy elsewhere; none has been found. It is possible that the condition can be due to a bronchogenic carcinoma, but it is only a theoretic assumption until an autopsy can be obtained.



## DERMOID CYST OF THE NECK

THIS patient is a girl six years of age. She came to the hospital because of a draining sinus in the side of the neck. Since she was a baby there had been a lump in the neck which intermittently opened up draining a small amount of thin pus. Of late there has been a persistent draining sinus sometimes with enough discharge to warrant a dressing, sometimes not. Other than the inconvenience of the dressings it has caused no trouble. Physical examination was negative except for the sinus opening. It was 2 mm in diameter situated in the right side of the neck just in front of the anterior border of the sterno cleidomastoid muscle and at the level of the upper border of the thyroid cartilage. There was a moderate amount of scar tissue about it and beneath the skin forming a palpable lump the size of a lima bean. A probe could be pressed upward and inward for 3 cm. It was injected with methylene-blue, but no solution appeared in the pharynx. It was also injected with a 15 per cent solution of sodium bromid and an x ray taken in an effort to determine the size and extent of the fistula, but the solution would not enter more than 1 or 2 cm. This seemed a typical example of a so called branchial fistula. Various antiseptics and irritants were injected into it for several months to no avail, so it was decided to remove the tract *in toto*.

The sinus was injected with melted paraffin colored with methylene blue, as advised by S. W. McArthur, in order to facilitate its dissection. A transverse elliptic incision was made about the sinus opening and the surrounding scar tissue. The upper flap was raised as far as the mandible. This incision was used in preference to a longitudinal one because of the much less noticeable scar that would result. The sinus tract filled with paraffin formed a tough tube 5 mm in diameter and was easily separated from the surrounding tissue by blunt dissection. It passed behind the posterior belly of the digastric and followed

along behind it in the same direction. It was dissected up as far as the styloid process to which it was firmly attached, no further extension could be demonstrated, exposure was difficult, and it was uncertain that the distal extremity had been completely removed. The ideal method when the fistula extends into the pharynx is that of von Hacker, in which the tract is cut off as high as possible, then turned inside out into the pharynx. This method has been applied and described very clearly by Christopher. The wound was closed with drainage.



Fig. 344.—Microphotograph of the distal end of the fistula shows cartilage, glandular tissue, sweat glands, and hair follicles.

Dr Jaffe on microscopic examination of the proximal part of the sinus found it consisted of a fibrous tube lined by granulation tissue, there was no evidence of epithelial structure. In the distal part, however, there were nests of epidermoidal cells with large apocrine sweat-glands, small islands of hyaline cartilage, and gland like structures (Fig. 344). It has the typical microscopic appearance of a dermoid cyst, and the clinical his-

tory and finding of a branchial fistula. Cartilage has been reported as present along these fistulae, but I can find no record of such a characteristic picture of a dermoid cyst ascribed to branchiogenic fistulae. We have suggested that it was a true dermal cyst which broke through to the skin and drained intermittently.

The patient on return at the end of three months has complete healing with no further evidence of the sinus.



## CLINIC OF DR FDMUND ANDREWS

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### DUODENAL ULCER; GASTROJEJUNOSTOMY

OUR first case this morning is that of a man aged forty eight, who entered the hospital two weeks ago complaining of chronic indigestion and pains in his right leg. The leg condition is clearly a sciatic neuritis. There is pain and well localized tenderness along the entire course of the nerve from the sciatic notch to the popliteal space. Extreme flexion of the leg on the thigh is quite painful. There are no other findings in this connection.

His indigestion is a much more important feature of the case. For several years he has been having pain after meals. It is described as burning in the epigastrium, spreading into the chest. He eructates sour material. This pain comes on in spells lasting two or three months and then disappears for a few weeks. Lately it has been particularly severe. It comes on an hour or two after each meal and often lasts up until the next meal when it is promptly relieved by taking food. Alkalies also bring about prompt relief. Night pain has been a marked feature of the case. It often lasts right through until morning and the loss of sleep has rendered the patient rather nervous. There has been some loss of weight, just how much is not known, but he is rather thin now. There is no history of jaundice, vomiting, bloody stools or dark urine, nor any history of acute abdominal pains. Physical examination except for the neuritis is negative. There is no tenderness over the gall bladder or appendix, nor are there any masses palpable in the belly.

His blood findings are as follows: 8800 leukocytes, Hb 100, coagulation time four minutes.

The urine is negative. The stools contain blood in nearly

every examination, but no copious hemorrhages have occurred. Gastric analysis after an Ewald meal showed 45 free acid, and 70 combined. Blood was present in considerable amounts.

$\alpha$  Ray examination (Fig. 346) showed that there was considerable retention of bismuth in the stomach. The duodenal



Fig. 345

cap was extremely deformed, in fact, it was almost absent. Under the fluoroscope it could not be made out than is here pictured. Another characteristic marked hyperperistalsis. As seen it is extreme-

the lesser and greater curvatures Under the fluoroscope this was quite persistent and the hypermotility was very marked

We have, therefore, a case giving a typical picture of duodenal ulcer In spite of the extent of the deformity, if this were a private patient I would refer him for a course of medical management He has had no severe hemorrhages no signs of perforation, and has not a sufficient degree of obstruction to prevent adequate nourishment However, he has neither the intelligence nor the leisure to carry out such a treatment and, therefore I am going to do a gastro enterostomy and, if possible to excise the ulcer, although from the looks of the x ray plate I have grave doubts if the latter will prove feasible

In this type of surgery I am very conservative Reports from follow up clinics have definitely shown that in duodenal ulcer the percentage of cures from gastro enterostomy alone is 95 per cent It is my practice to resect only those duodenal ulcers which are readily accessible I know of no proof that the results are any better if the ulcers are resected, that it makes the results any better than 95 per cent Therefore it does not seem rational to take any risks to do this Many duodenal ulcers are on the posterior or lateral walls Others are tightly adherent to the pancreas or other organs, and I cannot see how the additional risk of resecting such ulcers is justified

The abdomen is opened in the mid line The liver edge is free and is normal in thickness and consistency The gall bladder is soft thin, and empties easily I am now pulling the stomach out of the belly, and a careful search reveals no pathology It is free, easily delivered, contains no ulcers or scars Here is the pyloric vein which I am barely able to bring into view on account of a very deep fixation of the duodenum In the duodenum I can palpate a hard indurated inflammatory mass which I have not as yet been able to see Now that the retractors are rearranged, we can get a glimpse of the duodenum It is not adherent to any of the adjacent organs, but is however, quite firmly fixed by its ordinary peritoneal attachments in its normal position What I described as an inflammatory mass is really a very large stellate scar which narrows the lumen to al-

most the size of a lead pencil (Fig. 346) Really, almost the entire circumference of the bowel is involved The stenosis is as marked as I have ever seen and the stricture is fully 2 cm long It is dangerously near the papilla

What am I to do now? This is not a healed ulcer, as the stools contain blood, and I would like to attack it directly Mobilization of this duodenum could probably be done by cutting its right peritoneal attachments but even then a long and difficult



Fig. 346

plastic operation would be necessary It seems to me that if gastro enterostomy will cure 95 percent of such ulcers, we should be satisfied with this prospect and do the conservative thing, a simple gastrojejunostomy without any attempt at resection I am quite sure that the mortality from such a procedure will not exceed 2 per cent , and is probably much less, as this man is in very good physical condition Any direct attack on the ulcer will double this mortality to say the least

The placing of this stoma is an important point In the jejunum it should lie as near the ligament of Treitz as one dares without jeopardizing the normal mobility of these upper ab

dominal organs No loop is left then which might tangle Also the higher the stoma is, the more accustomed the jejunum is to the acid contents and the less the likelihood of jejunal ulceration On the stomach side the stoma should lie in the long axis of the organ in the antrum

This operation will be done by the three layer method I have been accustomed to using almost exactly the original Bill roth technic Although this method takes a few minutes longer, I have the utmost confidence that it will not leak, which is more than I can say of any other method After placing my first row of Lembert sutures holding the bowels together, I am cutting through all the coats except the mucosa The next step is a series of interrupted sutures in these outer coats You see it really gives a union of cut edge to cut edge The mucosa is now opened and the bowels are closed by a circular stitch in the mucous membrane alone I am putting these stitches in very close together, and when this row is completed I will have an air tight closure Now my row of interrupted sutures is completed across the anterior side of the stoma and the whole buried in the continuation of the first Lembert row After the closure of the rent in the transverse mesocolon the abdomen is closed without drainage



## NON UNION OF BOTH BONES OF THE FOREARM DOUBLE BONE PEG

THIS patient Mr T A , aged sixty entered the hospital September 28 1925 He gave the history that nine months previously while working a saw mill the belt had broken striking the forearm about the middle Great pain ensued and the arm was "loose and floppy " His family physician told him that he had fractured both the radius and ulna in the middle thirds Under an anesthetic the fracture was set and a cast applied Since that time the arm has been in splints or casts but there is still a point of false motion in the middle third of the forearm The patient's past history is negative He denies any venereal infection In spite of this fact, the letter from his family doctor gave a history of a four plus Wassermann made six months after the fracture when it was evident that it was not healing A course of antiluetic treatment has now rendered the Wassermann negative The physical examination is also negative and there are no stigmata of syphilis visible x Ray picture (Fig 347) as you see, shows that the position of the bones is remarkably perfect Not only is there accurate position of both ends of each fragment, but the bones are well separated in the forearm and almost complete power of rotation is present One can have nothing but praise for the previous surgical work done upon this patient There is, however, practically no callus formation around the fracture of either bone and the forearm can be bent at this point to an angle of 30 degrees anteriorly and about 10 degrees in the opposite direction When this patient was first seen, nine months after his injury, it was felt that perhaps a little traumatism of the ends might bring about new bone formation Accordingly, the splint was removed and the patient encouraged to use his arm for several weeks, the splint being replaced at night so as to maintain alignment and prevent accidents At the end of this period through tiny stab wounds

about  $\frac{1}{8}$  inch long on each side of the arm a bone drill was inserted and holes bored into the two ends of the bone and adjacent soft tissues. It has been my experience that measures of this sort are very valuable adjuncts in our treatment of non union. In



Fig. 347

this case a very definite improvement followed and was progressive for about two months, but since then the condition has been stationary.

It has always seemed to me that surgery of non union of

bones was one of our most conspicuous failures. In the first place we know practically nothing of the etiology of the condition, although, as in this case, syphilis may be a factor. I am very doubtful about it. It has not been my experience that any higher percentage of non union cases give positive Wassermann, than one would expect from the normal incidence of the disease besides from what we know of bone syphilis, it is characterized by exactly the opposite condition, that is, hyperostoses. It is generally a highly proliferative bone disease. Again, it is common knowledge that fractures in florid syphilis seemed to heal kindly. We must go deeper than thus for the true explanation. It is probably some disorder of calcium metabolism of which we have as yet only an inkling.

Again our treatment is never based on eradicating the roots of the disease. Lane plates, ivory pegs, and wire etc., can do no more than hold the bones in position and, as in this case the position is often already perfect. I am not including in the category of non union those cases with an evident interposition of soft parts where, of course, you have almost 100 per cent of cures. It is the aplastic type which worries us. What more can the surgeon do, and what guarantee have we that our surgery will be of any avail whatsoever? This case very clearly has no interposition of soft parts. The bones are beautifully opposed and the insertion of plates, wires, or mechanical device to promote immobility seems futile.

The standard operation in this type of case is the living bone peg but I am very doubtful if the whole procedure amounts to anything more than a severe trauma. Certainly the small pegs which are inserted in the medulla of these bones have very little value in the prevention of motion. It is clearly certain in my mind at least that as a stimulus to new bone formation their value is zero. I believe that the benefit of these operations is solely due to the fact that we remove the section of uncalcified callus and above all, cause an extensive traumatization and irritation of the bone ends, and that is the real factor in the improvement which results. Surely no bone graft really lives. It acts as a scaffold through which the new bone may grow. The

only reason I see for putting these little pegs in the bone is to hold it in place temporarily after I have thoroughly cleared out all present callus

With these facts in mind we will proceed to the operation. I am making a small incision on each side of the arm directly over the palpable callus. As we come down on to the radius we see that the two ends are perfectly in line and are buried in a spindle shaped mass of fibrous tissue. This part of the operation will consist mainly of whittling. With a sharp knife I am scraping the excess of this fibrous tissue endeavoring to preserve a little of the periosteum if possible. Now you see I have reduced the size of the spindle to nearly that of the bones above and below. With a saw now I am removing the disk of bone about 2 cm at the point of fracture so as to present new raw surfaces not clogged up with a fibrous callus. With a reamer we are now clearing out a hole in the medulla. The medullary cavity in these cases is nearly obliterated and I regard it as quite important to thoroughly ream out the ends of the bone. The same procedure is being carried out with the ulna and we now have two fairly clean raw bones which one can place end to end after producing about  $\frac{1}{2}$  inch shortening of the forearm.

Through a curved incision now I have exposed the anterior surface of the right tibia and with my electric saw one can very easily remove a sliver triangular in shape about 10 cm in length and 1 cm in diameter. You will note that I am preserving the periosteum which I regard most important in the transplant. In fact some surgeons have gone so far as to make transplants consisting solely of the periosteum. It is well known that the cortex of transplanted bone acts merely as a foreign body. A slight amount of new bone formation may occur in the endostium, but the periosteum is the overwhelmingly important factor. In the use of the electric saw in these transplants one must be exceedingly careful to avoid overheating, and for this purpose the intern stands ready with sponges and a large basin of water. This peg is now cut into two portions the small sliver for the ulna and the large piece for the radius. To get both pegs into place is sometimes rather difficult. The fragments of the

bone are reamed out far enough to allow the pegs to be inserted until they are flush with the surfaces. Then the arm is laid in position, and while traction is made upon the hand the pegs are worked down into place. That in the ulna sticks firmly in place, but the one on the radius side I am holding with a kangaroo tendon ligature which will last long enough for our purpose. After careful hemostasis these wounds are closed without drainage and the cast is applied. This cast will have to be opened at once and the inflammatory reaction will probably be considerable.

I do not as a fact, intend to preserve immobility. I regard a slight degree of motion inside of a loose cast or splint as a positive benefit in these cases and as stated above the periosteum is the most important part of the operation. As for the results to be expected I am by no means enthusiastic. We are simply making the best of a very bad business. Certainly no other method offers any hope whatsoever, and I think for that reason our surgery is warranted, but it is a great mistake to promise your patient a cure because disappointment is very liable to ensue.



## CLINIC OF DR JOHN D KOUCKY

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### GASTRIC ULCER WITH PYLORIC OBSTRUCTION

THIS patient a woman twenty eight years of age, has had epigastric distress for the past five years. At the onset the distress was colicky in character. For this the gall bladder was drained with partial relief. One year ago her gall bladder was removed because of continuous epigastric pain and backache. She came to us complaining of her old epigastric pain and of vomiting. The latter had been present only for three months. She vomited daily, the vomitus frequently containing food eaten two or three days previously.

General examination showed nothing unusual. Nutrition was only fair. The gastric test meal gave a free acidity of 46, combined 54. Roentgenologic examination of the stomach showed a pyloric obstruction with a high grade retention. The plasma CO<sub>2</sub> combining power was 63, blood chlorids 495 gm. Preoperative preparation consisted of gastric lavage twice each day and administration of normal salt solution by rectum and by hypodermoclysis.

At operation great difficulties were encountered because of dense adhesions throughout the entire upper abdomen. The right half of the stomach first portion of the duodenum, transverse colon and omentum were firmly frozen together and to the liver. Enough of the stomach was finally freed to permit palpation of an ulcer crater about 2 cm in diameter perforating the posterior wall of the stomach near the pylorus and involving the pancreas. A posterior gastro-enterostomy was done, the gastric stoma was made further to the left than usual.

Convalescence was uneventful. Two months after the op-

eration the patient was feeling well had gained weight and considered herself cured.

This case is of interest both as to diagnosis and treatment. It illustrates well the necessity of thorough exploration in operations on the upper abdomen. The association of peptic ulcer and gall bladder disease is so frequent that in the presence of one the other should always be ruled out by careful inspection and palpation. The preoperative diagnosis in this case based on the x-ray findings and the history of repeated operations was stenosis of the pylorus resulting from adhesions. Only through tedious dissection was the true diagnosis revealed.

Therapy here must consider an obstructed stomach with a mild degree of alkalosis. Beckman among others has recently called attention to the dangers and their treatment to which a patient handicapped by an obstructed stomach is subjected. He has shown that by gastric lavage two or three times a day and restoration of fluids by forcing them by mouth by rectum and by hypodermoclysis makes these patients approximately normal surgical risks.

The recognition of alkalosis in these cases is one of the real advances made in gastric surgery in recent years. Clinical and experimental workers have shown that these patients have characteristic blood findings which permit recognition long before symptoms develop. The CO<sub>2</sub> combining power of the blood increases often over 100, the blood chlorids drop from around 630 to below 500 or even 400. With these changes the non protein nitrogen of the blood is increased not rarely going over 400. When alkalosis is well established the usual symptoms are headache, stupor, delirium and tetanic seizures. The urine is scanty and contains much albumin.

In the presence of alkalosis treatment has two objectives: restoration of blood chlorids and of body fluids. This is best accomplished by giving normal salt solution by rectum and by hypodermoclysis. When the need is urgent it should be given intravenously.

Alkalies are definitely contraindicated. It is important to remember this as alkalies are an important part of several types

of medical management now in vogue. Excessive alkalies therapy will produce an alkalosis even though the stomach empties normally.

The preoperative care outlined above will make a normal surgical risk of a patient with gastric obstruction only if nutrition is fairly good. Those with poor nutrition, even after proper preoperative care, will not tolerate the radical procedures now advocated. In these gastro enterostomy is the operation of choice. It relieves the obstruction which is the immediate cause of the patient's serious condition. In about 50 per cent of cases it not only relieves the obstruction, it leads to healing of the ulcer. Those who continue to have symptoms can then be subjected to a secondary operation and the ulcer dealt with as desired with a small risk. The ulcer will usually be partially healed, adhesions less extensive, and the stomach will have shrunk to almost its normal size. The principles of the many stage operations as applied to chest, colon, and thyroid surgery with such brilliant results can equally well be applied to surgery of many cases of gastric ulcer with obstruction.

two duodenal ulcers within a few days. Multiple simultaneous perforations are not unusual. It has been estimated that 20 per cent of perforations of peptic ulcers are multiple. Only a few consecutive perforations, however, are recorded.

The second perforation resulted in a duodenal fistula--a most serious complication. Realization of this seriousness and the assumption that the pyloroplasty failed to heal, led to an attempt to close the opening in the duodenum. The failure of the sutures to hold was not unexpected, because of the unfavorable operative field. The early adoption of the more conservative measures : e. g. jejunostomy and protection of the skin by constant sucking up of the secretions, I believe would not have avoided the fatal issue for the infection of the liver was too extensive.

CLINIC OF DRs KARL A MEYER, WILLIAM A BRAMS,  
AND WALTER L PALMER

COOK COUNTY HOSPITAL

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SOME INDICATIONS FOR THE SURGICAL TREATMENT  
OF GASTRIC AND DUODENAL ULCER

OUR clinic today will be devoted to the presentation of patients who illustrate certain principles which guide us in the selection of surgical treatment for cases of gastric and duodenal ulcer. Not only are these patients examples of those requiring operation, but we shall also attempt to give our reasons for recommending surgical management and also to explain why certain operations are preferred in given instances.

The first patient illustrates the principle that chronic, uncomplicated peptic ulcer should be operated upon if it does not respond to a prolonged course of careful dietetic and alkali management and if on x ray examination there is still a prominent niche which has not become reduced in size after several weeks of medical treatment.

**Case I** — This patient gives a typical ulcer history of two years' duration and stated that his pain had become very severe in the last few weeks and that alkalies were then practically without effect. Examination showed a poorly nourished, middle aged male with distinct tenderness in the epigastrium. An Ewald test meal showed free HCl 85 and total acidity 90. Numerous examinations of the stools did not reveal blood. X Ray examination showed a large niche on the lesser curvature of the stomach at the pars media, confirming the clinical diagnosis of penetrating gastric ulcer. He was placed on accurate medical management with aspiration of the stomach when indicated but no relief was

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infiltrated and the cicatricial induration, together with the under-nourishment, probably were very important factors preventing healing. The pyloric portion of the stomach was resected and a typical Poly operation performed. A resection was considered best in this instance because of the extensive infiltration and cicatrization, and because it was thought that the soil was favorable either for a recurrence or the formation of another ulcer unless a radical operation was performed. The justification of the choice of the operation is seen in the subsequent course which resulted in a complete cure with the patient on a diet of ordinary food.

The second patient illustrates the principle that operation is indicated in chronic, uncomplicated peptic ulcer if there is no response to a prolonged course of well managed medical treatment, or if the symptoms return shortly after the treatment is discontinued. These ulcers are usually large and have undergone considerable fibrosis and are very often adherent to or have penetrated into some adjacent viscera, usually the pancreas. Any form of treatment short of radical resection is usually only a temporizing step, and in this particular instance there was also an *economic indication* for prompt and permanent relief even if radical treatment was the only means of obtaining a cure. This patient, as well as many others, was a laborer, and was the sole means of support of himself and family, and could not afford to spend much time in bed or be on a strict diet while at work. Such patients are confronted by a real economic situation and operation should be seriously considered, especially if conscientious treatment has been tried and has not provided permanent relief.

**Case II**—This patient was in the hospital for ten weeks and at home for five months, during which time he underwent strict dietetic and alkali treatment for peptic ulcer. He felt well as long as he continued treatment, but all his symptoms returned after he was off his strict diet for three days. On his second return to the hospital a motor meal showed no retention but in Ewald test meal showed free HCl 58 and total acidity 91. Pre-

vious x ray examination showed evidence of a duodenal ulcer, but without obstruction. He was again placed on Sippy management for a few days in order to improve his general condition before operation. Operation revealed a large, chronic, unhealed duodenal ulcer which had perforated through the posterior wall into the pancreas and which was surrounded by extensive adhesions. In view of the chronicity, extensive adhesions and perforation it was considered best to do a resection of the involved portion of the duodenum and pyloric part of the stomach in order to minimize the possibility of a recurrence. A Polya operation was performed and the patient, who formerly experienced relief only while on strict diet and alkali management has now been free from all symptoms for a year and eats ordinary food three times a day.

The next group of cases developed obstruction as a result of ulcer and illustrate the principle that peptic ulcer should be operated if associated with organic stenosis which does not respond to medical treatment. In considering surgery for obstruction we must be certain that the stenosis is organic and not spasmodic or the result of inflammatory thickening as the two latter factors in narrowing often submit to medical treatment so that the obstruction due to actual scar formation, if any is present may be overcome by careful dieting and if care is taken not to overload the stomach at any one time. The gastric musculature may be competent to overcome the actual obstruction if the diet is carefully regulated in quantity and quality and if the stomach is occasionally aspirated if overloaded. Such cases may escape operation if the gastric tone and contracting ability is carefully managed so that no marked retention occurs.

**Case III**—This patient is an example of duodenal ulcer followed by high grade obstruction and associated with continued excessive secretion. This combination is a distinct indication for operation, especially if the secretion cannot be controlled by diet and the use of alkalies. The patient had ulcer symptoms for two and a half years and during the last few months vomited

large quantities of food eaten several hours previously. He had been on careful Sippy management for six weeks but his distress returned three weeks after the treatment was stopped. Examination showed a point of tenderness slightly below the navel and a motor meal revealed considerable retention. The free HCl after an Ewald test meal was 55 and the total acidity was 70. X Ray examination showed a low lying stomach with a constantly deformed duodenal bulb and definite retention after six hours. He was again placed on Sippy management but there was no improvement after four weeks and repeated aspiration of his stomach showed an uncontrolled highly acid secretion although huge doses of alkali were used.

*Comment*—This patient had an early recurrence after a course of medical management and no relief was obtained after four weeks of further treatment with diet and alkalies. Repeated aspirations revealed the presence of large quantities of highly acid secretion and we can safely assume that spontaneous healing can hardly occur in such cases especially if large quantities of alkalies cannot control the acidity as such a secretion constantly present in the stomach is certainly an important factor preventing healing. Retention due to obstruction and associated with pronounced hypersecretion which cannot be controlled by medical management is considered by us an indication for surgery. The type of operation will depend on the findings after the abdomen is opened but in general it may be said that resection is indicated in obstruction with continued secretion of a highly acid gastric juice while simple gastroenterostomy is sufficient where there is only a moderate secretion of low grade acidity. In this patient resection was performed not only because of the above indication but because the duodenal ulcer had perforated into the pancreas and a mass of adhesions had covered the duodenum and pyloric part of the stomach. A Poly<sub>2</sub> operation was performed and the patient was discharged with instructions to continue small doses of alkali. The patient has been free from all symptoms since his operation and several test meals showed a slight secretion with free HCl never more than 10.

**Case IV**—This patient speaks no English and a history cannot be elicited which can be of any value to us except that he had had symptoms suggestive of ulcer for fourteen years and that he had been getting worse recently. Examination revealed an area of tenderness in the right upper quadrant. No blood was found in the stools on repeated examination. The pain was not increased by ingestion of dilute acid, so that it was assumed that the ulcer was fairly well healed. X Ray showed a deformed duodenal cap and retention after six hours. There was also visible peristalsis and a motor meal showed definite evidences of retention. The patient was placed on accurate alkali management, but experienced no relief leading us to the conclusion that he had a high grade cicatricial obstruction which required surgery. In view of the fact that there was no night secretion and that the acidity was easily controlled by alkalies as determined by aspiration of the stomach contents it was considered that simple gastro enterostomy would be sufficient in this instance, as all that was needed was to provide ample drainage for the stomach. A simple gastro enterostomy was accordingly performed after which it was found that there was no further retention and that there was an absence of free HCl both during the day and night.

*Comment*—Unlike the third patient, this one had no hypersecretion and no hyperacidity although both had a high grade organic obstruction. The only factors needing regulation in the latter case were the retention and obstruction. Healing would probably take place if the stomach emptied properly as the gastric juice could be easily controlled. Experience had taught us that simple gastro enterostomy is the method of choice in organic obstruction without hypersecretion and that the most lasting and perfect results are obtained with this operation in this class of patients. The patient has had no distress after the operation and has felt well ever since.

The next patient illustrates several interesting features relative to hemorrhage from peptic ulcer. This patient had repeated hemorrhages from his ulcer but no other distress for the past few years so that it could be safely assumed that his ulcer was

completely healed during most of this time, a supposition proved at subsequent operation. Still, the danger of profuse and repeated bleeding was always present and the absence of pain and other symptoms was absolutely no indication of what was actually going on in the abdomen so far as the chances for further hemorrhages was concerned.

**Case V**—This patient was thirty six years old and had a profuse hemorrhage ten years ago, but without any pain or other dyspeptic symptoms either at the time of his bleeding or for eight years subsequently. He felt perfectly well until three years before admission at which time he was "gassed", and since which he has had symptoms suggestive of ulcer. He had a profuse hemorrhage three days before admission, and still another a few days after he had been in the hospital. Examination showed marked pallor and anemia and he was put on expectant treatment in order to improve his general condition before operation. Examination a short time later showed an absence of free HCl and the x ray showed evidence of peptic ulcer with retention. Occult blood was still constantly present in the stools in spite of the absence of acid in the stomach contents and the fact that he was now free from symptoms. Operation was advised because of the persistence of blood in the stools, but the patient preferred to try medical treatment for a while. This he continued for three and a half years during which time he felt well. Another profuse hemorrhage occurred shortly before his last admission, and it was again decided to operate after building up his general condition for a while. Operation revealed extensive scar tissue along practically the entire lesser curvature of the stomach, but there was no open ulcer. A Poly a operation was done and the patient has been free from hemorrhage and all symptoms since the operation which was done a year ago.

**Comment**—The lesson to be drawn from this case is the principle that ulcers may remain clinically dormant for a long time and that profuse hemorrhage may be the first manifestation of the underlying lesion. Another feature is the possibility of a peptic ulcer healing completely several times so that no symp-

toms are present as occurred in this case and still there may be danger of bleeding. There can be no question that the ulcer in this case healed several times as the extensive scar tissue shows but the danger of a recurrence was not obviated. This case also shows that while a single hemorrhage may be treated medically repeated bleeding should be considered an indication for operation even though the acidity and symptoms can be controlled as the problem in these cases is to keep the ulcer healed in the presence of the factors which caused the formation of the ulcer originally.

The next patient illustrates a complication resulting from operation for peptic ulcer namely perforated jejunal ulcer with adhesions around the stomach and small bowel.

**Case VI** —This patient had ulcer symptoms for about four years and was operated at another hospital about five months ago. He was instructed to continue on a light diet and to take alkalies regularly which he did. About three weeks ago he suddenly developed severe pain and tenderness in the epigastrium and also noticed a small mass in this region. The pain was continuous and examination of the mass showed that it was about the size of a hen's egg and was very tender. A motor meal showed evidence of retention and blood was found in the stools. An Ewald test meal showed free HCl 82 and total acidity 102. X Ray examination suggested the presence of an ulcer. A diagnosis of ulcer with perigastritis was made and the patient was placed on Sippy management for a few weeks but his acidity could not be controlled even by twice the usual dose of alkalies even though his distress and mass had disappeared. X Ray examination showed that the gastroenterostomy was not functioning well although there was no definite evidence of obstruction. The patient was sent home on trial and was instructed to continue with his high doses of alkali and careful diet. He returned in three months stating that his symptoms had come back and that the mass had also recurred. In view of the transient relief and our inability to control his acidity at any time operation was recommended. An ulcer of the jejunum was

found opposite the stoma of the gastro-enterostomy. This ulcer had perforated anteriorly so that its base was formed of the anterior abdominal wall. The loop of the jejunum containing the ulcer and the pyloric half of the stomach including the site of the gastro-enterostomy were all resected and a Polya operation was performed. Complete recovery followed and a test-meal taken some time after operation showed free HCl 0 and total acidity 18.

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# CLINIC OF DR. IRVING F. STEIN

MICHAEL REESE HOSPITAL

## OVARIAN ENLARGEMENTS

OVARIAN enlargements are of considerable importance in diagnosis. The gynecologist and general surgeon are alike concerned in an analysis of swellings of the ovary because of surprises met with at the operating table due to errors in diagnosis. These errors are not so frequent when frank tumors are present, but occur oftener with those swellings accidentally discovered during a pelvic examination which have caused the patient but few symptoms referable to the ovaries.

For the purpose of this discussion I have chosen to group ovarian enlargements as follows:

### *Ovarian Enlargements*

#### I Functional

##### 1. *Corpus luteum:*

- (a) False (menstrualis)
- (b) True (gravitatis)

#### II Dysfunctional

##### 1 Corpus luteum cysts

- (a) The small unilocular cyst which clinically simulates ectopic pregnancy and which is the most common type.
- (b) Alternating periodic ovarian swellings (Ries)
- (c) Spontaneously disappearing cyst (Stein)
- (d) Lutein cyst complicating pregnancy
- (e) Bilateral multiple theca-lutein cysts associated with hydatidiform mole and chorio epithelioma

#### III Neoplastic

##### 1 Benign

###### (a) Cysts

- 1 Follicle—simple serous
- 2 Cystadenoma—serous or pseudomucinous

###### (b) Teratomata

- 1 Dermoids
- 2 Chocolate cysts (endometrial implants).

- (c) Solid tumors
  - 1 Fibroma
  - 2 Peri- and endotheliomata
- 2 Malignant
  - (a) Sarcoma
  - (b) Adenocarcinoma
    - 1 Papillary carcinoma
  - (c) Pseudomucinous cyst associated with pseudomyxoma peritoneum

For the present discussion let us take up Groups I and II

#### I. FUNCTIONAL ENLARGEMENTS OF THE OVARY

(a) False Corpus Luteum —A patient may present herself for diagnosis because of pelvic pain or discomfort cramps or bearing down sensation occurring one or more days before menstruation. If the patient is examined at this time tenderness and swelling of the ovary containing the corpus luteum of menstruation may usually be found. This swelling is physiologic and requires no treatment *per se*. It is however disturbing diagnostically when

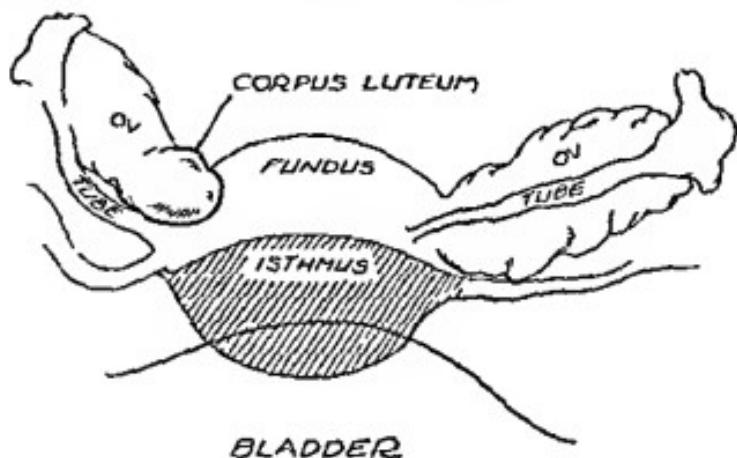


Fig 349.—Corpus luteum menstrualis right ovary polycyst peritoneum

found in a case of sterility where for ovarian or other pelvic ab- ally confusing in such a cas In one such instance we dep pneumoperitoneum in the cou

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patency test for sterility (Fig. 349). If one keeps this physiologic structure in mind and considers its relationship to the menstrual cycle, it rarely need present any difficulty. The surgeon should also be familiar with the macroscopic picture of the corpus luteum in order that he may avoid unnecessary resection of the ovary when a corpus luteum is found at laparotomy.

(b) **True Corpus Luteum.**—The true corpus luteum grows considerably in size in the early months of pregnancy, so that occasionally during an examination in this period an ovarian swelling may be detected which may be mistaken for a pathologic structure. When the history of pregnancy is lacking or is wilfully withheld by the patient, and upon examination an enlarged ovary is found, it may be held responsible for the amenorrhea, especially when the other presumptive symptoms of pregnancy are absent. The discovery of such a swelling calls for repeated examinations, and in order to prevent diagnostic errors sufficient time should be allowed to observe the uterine alterations in size and consistency and to await the appearance of additional signs of pregnancy. Time and subsequent repeated examinations are valuable assets to careful diagnosis.

## II. DYSFUNCTIONAL ENLARGEMENTS

1. **Corpus Luteum Cysts.**—(a) The type of corpus luteum cyst most frequently encountered is that which is associated with an almost typical clinical history of tubal pregnancy. The story usually is that the menstrual period is overdue when spotting occurs, associated with severe pain referred to one side of the pelvis and accompanied by faintness or actual fainting. In addition, nausea may be present, the breasts retain their pre-menstrual fulness and sensitiveness, and there is increased frequency in urination. Upon bimanual examination the uterus is found soft and succulent, and a swelling of 2 to 3 cm. in diameter is discovered in one adnexa which is soft and exquisitely tender. This cystic swelling is easily ruptured if force is used in palpating, then menstruation follows within two or three days and the disturbing symptoms disappear. If the diagnosis of a corpus luteum cyst could be made with certainty and the possi-

- (c) Solid tumors
  - 1 Fibroma
  - 2 Peri- and endothelioma
- 2 Malignant
  - (a) Sarcoma
  - (b) Adenocarcinoma
    - 1 Papillary carcinoma
  - (c) Pseudomucinous cyst associated with pseudomyxoma peritonei

For the present discussion let us take up Groups I and II

#### I FUNCTIONAL ENLARGEMENTS OF THE OVARY

(a) False Corpus Luteum — A patient may present herself for diagnosis because of pelvic pain or discomfort, cramps, or bearing down sensation occurring one or more days before menstruation. If the patient is examined at this time tenderness and swelling of the ovary containing the corpus luteum of menstruation may usually be found. This swelling is physiologic and requires no treatment *per se*. It is however disturbing diagnostically when

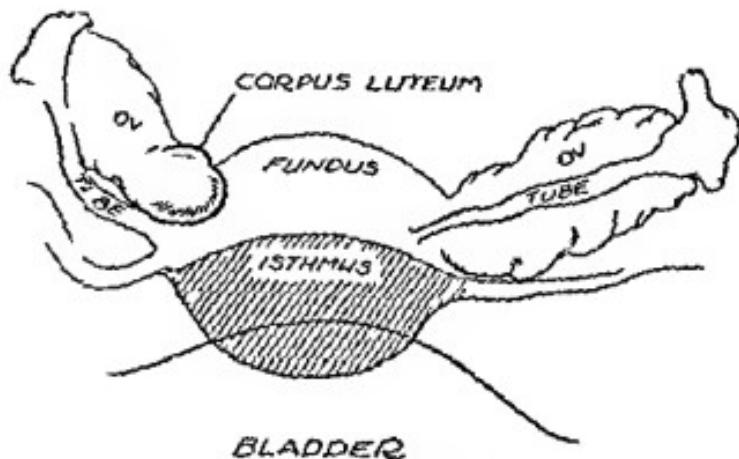


Fig. 349.—Corpus luteum menstrualis; right ovary polycystic. Pneumoperitoneum.

found in a case of sterility wherein a careful search is being made for ovarian or other pelvic abnormality, and may prove especially confusing in such a case if the menstruation is irregular. In one such instance we depicted a normal corpus luteum by pneumoperitoneum in the course of Roentgen diagnosis after a

Eleven days after operation an apple-sized mass was noticed behind the uterus. In October, 1910 an infected gauze sponge was removed from the culdesac by colpotomy. In November a fist-sized right ovarian tumor was found. At laparotomy in December both ovaries were small, the right was thickened, and contained small cysts. The tubes were resected and the ovaries left. In the next three years alternating swellings were observed five times on the right, three times on the left, and twice on both sides together. In 1919 Dr. Ries added a third case to this group. The patient had been operated for prolapse in 1916 and two years later developed symptoms simulating ectopic pregnancy. At operation both ovaries were found cystic and had a chocolate colored content. The right ovary was removed and the left was resected. Four months later there was a fist-sized swelling of the left ovary, which Ries ruptured by bimanual pressure.

While no additional cases appear to be reported under this title, the following is quoted from Lawson Tait's "Diseases of Women," 1879, pp 129

"A case of alternating ovaritis, for which I have been unable to discover any cause, has been for some time under my care in the hospital practice. The patient, J. K., aged twenty-five, came to the hospital with well-marked acute inflammation of the left ovary. She had been married for three years and had never been pregnant. There was nothing in her history to make me suspect that she suffered from gonorrhœa, nor did she know of her husband having so suffered. The left ovary recovered in a few weeks but remained somewhat enlarged and very tender, and it was also somewhat fixed. In about two months she came back with the right ovary quite as severely involved, and has since been several times under care with recurrences on one side or the other, but both ovaries have never been attacked together, and none of the attacks have been associated with menstruation, which always irregular, has been gradually getting rarer and more scant."

Tait's case unquestionably belongs to this group, though published under another caption. The similarity of cases even to

the association of sterility and myoma is striking. The inflammation alluded to by Tait may have been perisalpingitis, as was observed in Ries' cases. These alternating cysts are apt to give rise to confusing differences in opinion if one physician diagnoses a right sided swelling another discovers one on the left, a third finds bilateral swellings and a fourth no swellings at all, each observation may have been correct and accurate if the examinations were made during different phases of the menstrual cycle. The necessity for continual observation and repeated examination is obvious if embarrassing diagnostic errors are to be avoided. If the surgeon will but bear in mind this peculiar characteristic of lutein cysts the above mentioned errors will be less likely to occur. We are at present at a loss to account for the development of these bizarre manifestations of ovarian dysfunction. Further studies upon the sterility problem may help to clear up the etiology of the corpus luteum cyst.

(c) *Spontaneously Disappearing Cyst*—At the meeting of the Chicago Gynecologic Society January 15, 1926 I reported the following case which I believe to be rather unique in the literature.

Mrs. C. H. aged twenty nine was referred to the author on July 27 1925 by Dr Harry Grable. Her sole pelvic complaint was a history of three years sterility. Her last menstruation had occurred on July 3 1925 of five days' duration moderate in quantity without clots and with but slight cramps for the first day. Her periods usually appeared every twenty seven to thirty days. Upon examination the uterus was found normal in size erect and freely mobile. The right adnexa was negative but in the left was a smooth, freely movable cystic mass about 7 to 8 cm in diameter which was quite tender. Cervical smears revealed no pus and the presence of only Doderlein bacilli. The following day a Rubin test revealed that the fallopian tubes were patent under 40 to 60 mm pressure. A liter of carbon dioxide was thus introduced by the transuterine route and a roentgenogram was made. The cyst shown in Fig 350 corresponded exactly to the palpatory findings. Eighteen days later the patient came to laparotomy without re-examination. To my

great surprise no cyst was found, but merely three  $\frac{1}{2}$ -cm. cystic elevations on the surface of the left ovary (Fig. 351A) and a small myoma on the posterior surface of the uterus. The right ovary was normal. The cystic portion of the ovary was resected for microscopic examination, and the myoma was excised. The pathologic diagnosis was "follicular cysts and a



Fig. 350.—Corpus luteum cyst. (Pneumoperitoneum.)

corpus luteum cyst surrounded by considerable hemorrhage; fibromyoma." We have in this instance a corpus luteum cyst which exhibits most unusual manifestations, and differing clinically from those described in the preceding group. This cyst was unilateral, of large size, much larger than the usual corpus luteum cyst, and is associated with myoma and with sterility. It differs from those described under II, 1 (a), which were confused with pregnancy. There was no amenorrhea nor were there symptoms suggestive of intra- or extra-uterine pregnancy.

Bilateral cystic ovarian enlargements associated with signs of apparent pregnancy should always arouse a suspicion of the presence of hydatidiform mole or chorio epithelioma. The cysts are multiple and are derived from the theca layer of atretic follicles. Their presence is usually a sign that the associated pregnancy is abnormal, and the true corpus luteum is ordinarily absent. It is not positively known whether the lutein cysts cause the formation of hydatid mole, or whether the pathologic pregnancy causes the ovarian enlargements. Virchow believed that an inflamed decidua was at fault, while Frankel thought that the true corpus luteum was crowded out by the cyst, and being thus injured unfavorably influenced the development of the ovum. Peukert disagrees with this view, for he found a corpus luteum in full bloom in a case of hydatid mole with double lutein cysts. Seitz claims that a pathologic proliferation of syncytium in mole and chorio epithelioma determines the formation of the lutein cysts and conversely Jaffé says that the excessive trophoblastic action and chorionic degeneration are due to the overproduction of lutein. Whatever the causal relationship of mole and double lutein cysts a characteristic interpedence exists between the two growths. If the cysts are removed surgically the mole aborts spontaneously within a few days—usually forty eight hours—as occurred in the case which we report above. If on the other hand the mole is evacuated, the cysts spontaneously disappear in a few weeks or months. Should chorio epithelioma supervene after the cysts have thus disappeared the latter may reappear (Santi).

Lutein cysts while not true neoplasms are found in circumstances which apparently indicate surgical treatment. A finer appreciation of the behavior and relationships of lutein cysts may spare many patients unnecessary major surgical intervention. Furthermore, when lutein cysts are found at laparotomy extreme ovarian conservatism should be exercised, especially in young women. I cannot subscribe to Peukert's advice to perform panhysterectomy for hydatid mole associated with double lutein cysts.

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## CLINIC OF DR LOYAL DAVIS

WESLEY MEMORIAL HOSPITAL

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### TUMORS OF THE CAUDA EQUINA

THE symptoms produced by slowly increasing pressure upon the spinal nerve roots and upon the spinal cord itself present many features which are of interest to the general practitioner, orthopedist, and urologist, as well as to the neurologic surgeon. This interest becomes a question of differential diagnosis between intraspinal tumors and diseases commonly encountered in these branches of medicine. Particularly is this true of the symptoms produced by tumors of the cauda equina.

You will remember that the spinal cord has a cone shaped termination, the conus medullaris, which ends opposite the top of the second lumbar vertebra. From the end of this structure a slender filament, the filum terminale, terminates on the posterior surface of the coccyx. You may also recall that at an early fetal stage the spinal cord occupies the entire length of the vertebral canal and the spinal nerves pass horizontally laterward to their respective intervertebral foramina. As development progresses the vertebral column increases in length more rapidly than the spinal cord. Since the latter structure ends opposite the top of the second lumbar vertebra in the adult, the lumbar, sacral and coccygeal nerves must descend vertically within the spinal canal around the conus medullaris and filum terminale to reach their intervertebral foramina. In this way a large bundle of nerve roots is formed which has received the very descriptive name cauda equina. It should also be remembered that the fibers of the spinal roots which form the cauda equina resemble peripheral nerves in that they have neurilemmal sheaths. This fact is extremely important, since without this structure nerve regeneration is impossible.



sacro-iliac joints. Flexion of the right thigh upon the abdomen exaggerated the pain. There was no paralysis or paresis of any of the muscles of the extremities or trunk and resistance to passive movement was equally strong throughout.

The left Achilles' jerk was absent and the right was found to be decreased upon each examination. Otherwise the deep tendon reflexes were equal and normal in all extremities. The right plantar reflex was diminished and at times absent while there was a frank flexor response upon the left side.

Sensory examination of the patient showed no disturbance of deep sensibility. There was a slight diminution of pain sense over the second, third, and fourth segments upon the left side. Tactile and thermal stimuli were everywhere accurately recognized. The rest of the neurologic examination was normal.

$\alpha$  Ray examination of the lumbosacral vertebral column showed no pathology of any description.

A spinal puncture was performed and the color of the fluid was clear. It was under 8 millimeters of mercury pressure and contained 6 lymphocytes per cubic millimeter. The first phase of a Nonne reaction was faintly positive, but the second phase was very strongly positive. The Wassermann reaction was negative.

*Comments*.—Several clinical entities immediately come to mind in a diagnosis of this patient's findings. To the majority of you at least a tumor of the spinal cord would be thought of last, if at all. The attacks of pain certainly suggested an origin from the attempted passage of a renal or ureteral stone. It was particularly noteworthy that the radiation of pain was quite characteristic of a genito urinary tract lesion. However repeated urine examinations were negative for microscopic or gross blood and for evidences of infection.  $\alpha$  Ray examination of the urinary tract were negative for calculi.

The complete absence of findings upon palpation and upon  $\alpha$  ray examination of the gastro intestinal tract spoke against a pelvic or abdominal tumor which, by pressure, was producing root pains.

Clearly defined  $\alpha$  ray plates of the vertebral column and the sacro-iliac joint showed no evidence whatever of an osteoarthritic

process. On the other hand, the limited movements of the spinal column in all directions made such a lesion possible and certainly the type of pain present might be produced by such pathology.

From the neurologic examination we had one definite finding and another which perhaps was equivocal. The left Achilles' jerk was always absent and the right was found to be decreased. A slight diminution of pain sense over the area of the right second, third, and fourth sacral segments was somewhat questionable. Taken together however, they suggested a lower motor neuron lesion, although muscular atrophy and a flaccid paralysis were absent. The fact that straining at stool, coughing, and sneezing produced an exaggeration or an acute onset of his pain was a very significant finding. This symptom is not uncommonly brought out and its explanation is due to a dislocation of an intradural mass or to the rise in intraspinal pressure attendant upon these acts.

Perhaps the most important diagnostic factor of all was the presence of a strong reaction for increased albumin content in the spinal fluid. As Ayer, Stookey, and others have pointed out, this reaction always strongly suggests the presence of a tumor.

Upon the diagnosis of a cauda equina tumor which in all probability was on the right side, a laminectomy was done on November 18, 1921. A small oval, cystic tumor mass perfectly encapsulated was found lying attached to the right lumbar second nerve root. It was opposite the spinous process of the second lumbar vertebra and near the intervertebral foramen. The tumor was partially hidden by the overlying roots of the cauda. The tumor was easily removed with a section of the nerve to which it was attached.

The patient made an uneventful recovery and has been well since. He is working on his farm and has suffered no inconvenience from the loss of bone necessary to expose the tumor.

**Case II** -This gentleman O. F., aged forty-five, is a carpenter by occupation. Ten years prior to his entrance into the hospital on December 20, 1921, he fell from a scaffolding and

struck upon his buttocks. He immediately had a sensation of tingling and weakness in both lower extremities but was quite able to walk to his home. This paresthesia in his lower limbs gradually passed away and he followed his occupation without trouble until six months before coming under observation.

He was exposed to a cold heavy rain while at work and the next day had severe aching pains across his lumbar region and down the back of his left leg. This trouble persisted for six weeks and was diagnosed as "lumbago." He was able to return to his work and was without symptoms except for occasional sharp pains which coursed down the posterior surface of his left leg and slight weakness in that extremity.

Seven weeks before entering the hospital he was chopping wood, and while so employed had a recurrence of severe pain in his sacro iliac region. At that time the pain radiated down the back of both legs. He had to stop work and his legs became so weak that he had to be taken home in a wagon. These pains persisted in severity and in the same location. He was thought to be suffering from "rheumatism." One week later he developed pains in his ankle joints and had a feeling of numbness about his anus and in scattered areas upon both legs. He could move his legs but they were very weak especially the left one, and he could not walk. At this time he began to have difficulty in urination and soon complete retention developed, so that he had been catheterized twice daily. One week before entrance he developed incontinence of his anal sphincter and noticed that he could not feel the bowel movements pass from him.

Physical examination revealed the following positive facts. All active movements in the lower extremities were present, but resistance to passive motion in both ankle joints and knee joints was very weak, more so upon the left than upon the right side. Resistance to extension of the thigh upon the trunk was strong upon the right side, but weak upon the left. The left gluteal fold had become flattened out, and the muscles of the left buttock were flaccid and atrophied. The circumference of the left thigh was 17 inches, that of the right thigh 18 $\frac{1}{4}$  inches. The muscles were soft and flabby. The circumference of the left

calf was 13 inches, and that of the right calf,  $14\frac{3}{4}$  inches. The left gastrocnemius muscles showed evidence of atrophy.

Upon examining the reflexes, it was found that the deep tendon reflex in the upper extremities were normal, as were the superficial abdominal responses. The left knee jerk was absent, while the right was diminished, and both Achilles jerks were absent. The anal reflex was absent, as was the bulbocavernosus and the left cremaster. The right cremaster reflex was diminished.

The examination of sensation showed a loss to pin prick, touch, and temperature sense on the left side over an area supplied by the lumbar third, fourth and fifth, and sacral first, second, third, fourth and fifth segments, while upon the right side there was a loss of touch sensation and a diminution of pain and temperature sense over the sacral segments. Muscle and joint sense was lost in the left foot and distinctly impaired in the right.

The blood and spinal fluid Wassermann reactions were negative. The spinal fluid cell count was 25. The fluid was slightly yellow in color and there was a strongly positive albumin reaction. X Ray pictures of the spinal column showed no pathology whatever.

*Comment*—The history of a trauma in this case suggests at first an injury of the spinal cord, but the rather prompt recovery rules out this fact. Nevertheless, it must be borne in mind that the patient dated his trouble from that incident, and the relation of trauma to the development of a tumor cannot be definitely proved or disproved. Subsequently, however, the outstanding feature in the patient's condition was the severe pain, at first in the right leg along the course of the sciatic nerve and later in the same location in the left leg. The occurrence of pain in this distribution should lead immediately to the suspicion of spinal cord involvement. A spinal cord tumor, a lesion of the cauda equina or a sacralization of the transverse process of the fifth lumbar vertebra with pressure upon the sacral nerve roots might produce such a clinical picture. The occurrence of pain and the symptoms of a lower motor neuron lesion speak against a spinal cord tumor. The nerves comprising the cauda equina resemble peripheral nerves in that they produce a lower motor

neuron type of lesion and have a neurilemma sheath so that they may regenerate after injury.

Clinical experience has shown that localization of the level of a lesion, particularly in spinal cord tumors, is frequently inaccurate. The level of sensory loss is usually not an accurate indication of the level of the lesion. It will be remembered that the fibers for pain and temperature sensibility cross to the opposite side of the cord in the segments above the level of the twelfth dorsal segment. They pass the opposite side completely only after having traversed a number of segments varying as to the portion of the spinal cord involved. Whereas in the thoracic region only one or two segments are necessary for complete crossing in the cervical portion of the spinal cord four and often five segments may be involved in this procedure. Consequently the level of the sensory loss may be one or more segments below the level of the injury in all unilateral and in some partial lesions. For this reason the loss of motor function is a much more accurate indication of the actual level of the lesion.

The loss of sensation about the anus is quite characteristic of cauda equina lesions. This is the so called saddle shaped anesthesia. The involvement of the left side more than the right and the bilateral involvement of the areas supplied by the sacral spinal nerves would point to a lesion upon the left side with a maximum involvement of the sacral nerve fibers. It is rather uncommon to find equal bilateral involvement with a cauda equina lesion. The lesion could be an intradural one or it could be of extradural origin affecting the structures of the cauda by pressure. The increased albumin content and cell count speak for an intradural lesion.

The patient was operated upon and the lumbar second to fifth vertebrae removed and the dura exposed. No extradural lesion was found but upon opening the dura mater a tumor originating from that structure and of the size and shape of a lima bean, was found compressing the sacral nerves of both sides and extending upon the left side upward to involve the lower lumbar spinal nerve roots. It was removed, together with the area of dura mater to which it was attached.

The patient made a good recovery. Before leaving the hospital he had regained control of his bladder and anal sphincters and six months later he was back at work. The sensation about the anus had not as yet become normal. He was examined today some four years following his operation and shows nothing of neurologic interest. He has been at work for the past three years and a half.

**Case III—G. B.** aged forty three a housewife by occupation presented subjective symptoms which would have excited the interest of the neurologist urologist and orthopedist.

In the early part of the year 1924 the patient fell down the stairs in her home and struck upon her buttocks. She was able to rise immediately and continued her housework without interruption.

In July 1924 she began to complain of pain in the exact center of the lumbosacral region. This pain was severe and aching in character. Accompanying this a knife like drawing pain was present in the buttocks. The patient was quite unable to bend forward because of the pain in her back. These pains would last for a few days to a week and then would disappear.

In January 1925 after these attacks of pain had been repeated many times the pain radiated from the buttocks down the posterior aspects of both legs as far as the ankles. This was more marked upon the right side. From the onset the patient had difficulty in starting her urine and upon several occasions required catheterization.

It is of interest to note that stooping over coughing and sneezing produced severe pains in both legs.

During the patient's illness x ray pictures of the lumbar vertebral column were taken and an osteo arthritis was diagnosed. Accordingly her tonsils and all of her teeth had been removed. The sidelight should warn you of the danger of placing too much credence upon the interpretation of any mechanical diagnostic aid.

The past history was quite without bearing upon the patient's present condition.

Examination showed that the patient was able to perform all active movements with her lower extremities. They were carried out very slowly and with great care. Passive flexion and extension of the right lower leg at times produced excruciating pain down the posterior aspect of the leg. Pressure in both popliteal spaces and down the course of both sciatic nerves produces marked tenderness. Resistance to passive motion is weakened, but equally so in both legs.



Fig. 353.—Tumor removed from G. B. Note the relation of the tumor to the nerve root, a part of which was resected with the growth

Sensory examination revealed that the patient recognized all forms of sensory stimuli over all of the segmental areas of the trunk and lower extremities. At times there was a suspicion of impairment of superficial sensation over the outer aspect of the right foot near the ankle. This was very variable.

The Achilles jerks were absent and could not be elicited under any form of reinforcement. All other tendon and superficial reflexes were normal.

Spinal puncture yielded a colorless fluid under normal man-

metric pressure. The Queckenstedt test was negative. The globulin reaction was negative, but the test for albumin showed a heavy flocculent precipitate.

*Comment*—Considering this case, the presence of severe root pains in both lower extremities, the loss of the Achilles jerks, and the presence of a marked albumin reaction in the spinal fluid were of the most significance. A diagnosis of a tumor of the cauda equina was made. Upon operation, a large perfectly encapsulated tumor was found attached to the posterior root of the second lumbar spinal nerve upon the right side (Fig. 353). It was necessary to resect a portion of this root to remove the tumor. It can easily be seen how this large mass produced the symptoms which were present. Microscopic examination showed the tumor to be a neurofibroma, similar in structure to the tumors found in the 2 preceding cases.

The patient made an uneventful recovery. Her pains immediately stopped and her urinary difficulty completely cleared up. She has assumed her former social and economic position and is completely recovered.

#### DISCUSSION

The story of these 3 patients illustrates how important it is to have in mind the possibility of the presence of a lesion of the spinal cord or cauda equina. All of these patients complained of symptoms which might very well have been attributed to involvement of other structures. As a matter of fact all of these possibilities were carefully investigated in each of these patients before attention was seriously directed toward the spinal cord.

Tumors of the cauda equina and spinal cord are not uncommon, and this fact should be realized by every physician. Realization of this point will obviate the indefinite diagnoses of "back pain of unknown origin," "lumbago," and "sciatica."

The immediate and permanent recovery of these patients attests the brilliant results of neurologic surgery. Especially is this true if the correct diagnosis is made early in the course of the lesion and the patient is operated upon before permanent damage to the spinal cord or nerve roots has occurred.

In retrospect we see, therefore, that cauda equina tumors produce a clinical syndrome characterized by severe radiating pain which follows the distribution of certain segmental areas. In addition, the findings of a lower motor neuron lesion are present to a degree dependent upon the size and chronicity of the lesion. Briefly these are flaccid paralysis, muscular atrophy, loss of deep tendon reflexes, and the presence of the reaction of degeneration. The sensory findings present include all modalities of stimuli since the posterior roots convey all sensation from the periphery to the cord, where redistribution occurs.

The most important laboratory findings are those in the spinal fluid. An increase in the albumin content of the fluid may be the only finding, or this may be accompanied by a yellowish tinged fluid and an increased cell count. A complete intraspinal block may be extremely difficult to demonstrate, and this can be understood if we recall again the structure of the cauda equina.

driver who fell from his seat and was impaled on the tongue of the wagon which dragged him for a considerable distance ripping open the symphysis and sacro iliac joint. In a case of a toe dancer cared for several years ago by Dr Bouffleur, the dancer in doing the split ruptured the symphysis.

**Pathology**—In rupture of the symphysis alone the cartilage remains fixed to one side or the other the separation being between bone and cartilage with one half of the symphysis posterior to the other. When symphysis and sacro iliac are separated the innominate bone is displaced backward and upward. We have never seen a separation of both sacro ilacs but from the anatomic relations the sacrum would be driven forward.

When disarticulation of the symphysis is combined with fracture many varieties may be produced—fracture through the wing of the ilium or through the acetabulum.

In fracture without disarticulation the most frequent occurrences are through the pubic rami or the ischium or a combination of both through the acetabulum sometimes driving the femoral head into the pelvis through the ilium in single vertical split or stellate fracture of wing or fracture of crest and anterior superior spine.

The damage to the soft parts varies greatly and may be slight or severe. When the pubic bones are fractured the viscera most often injured are the urethra and bladder the damage varying from slight laceration with slight hemorrhage to complete severance of the urethra and rupture of the bladder. The rectum is sometimes lacerated or a loop of small gut may be caught and punctured or severed. The bladder may be full at the time of the accident and though the bone fragment does not lacerate or puncture it the impact of the blow on a full bladder may rupture it sometimes intraperitoneally. Lacerations from the pubic bone fragments are more likely to be extraperitoneal followed by urinary extravasation. Urinary extravasation may follow high severance or laceration of the urethra.

Hemorrhage may be anything from a slight ooze from the urethra to a hematoma involving nearly all the soft tissues of the pelvic girdle.

Nerve involvement may be functional or anatomic severance of the anterior crural or sciatic trunks

An early diagnosis of all conditions both of bony structure and soft tissue, is imperative. If radiographic facilities are available an early radiographic diagnosis should be made. Determine soon the condition of the urethra, bladder and rectum. If a catheter cannot be passed into the bladder it may be that the urethra is severed.

An extraperitoneal rupture of bladder may be first manifest by urinary extravasation. An intraperitoneal rupture may first show as peritoneal irritation, resembling peritonitis with rigidity and tenderness. We have on only one or two occasions used the method of injecting a measured quantity of sterile water or boric solution into the bladder to determine its patency. If, on passing a catheter into the bladder, clear urine is withdrawn, we are satisfied to wait and watch the bladder for further developments, assuming that no rupture exists. If bloody urine in small amounts is found the catheter is left in and the patient's condition in the next few hours will determine whether or not a rupture exists. A ruptured intestine will be suspected usually only after signs of peritoneal irritation have developed. Shock may be so severe in the first few hours as to obscure the symptoms of other complications but the patency of the urethra, rectum, and often the bladder can be determined by examination at once.

Shock is often present and it should be determined early whether or not it is secondary to hemorrhage. If due to bleeding, its location and severity should be known. Nerve injuries may appear early with signs of paralysis or irritation or may come as a late complication in the form of neuritis.

Treatment must be considered under the heading of that to *bony structures* and that of the *complications*.

It often is necessary to treat the complications before considering the bony structure. Shock when present will demand first attention. The general measures of heat, morphin and lowered head are of some value as early, prompt aids. The administration of glucose 5 per cent intravenously or subcutaneously, and finally in severe and prolonged cases the transfusion

of whole blood. The careful handling of the condition of shock may determine the entire outcome of the case.

A ruptured urethra in the female usually is not in itself difficult to manage as a catheter can generally be passed into the bladder. In the male it may be impossible to pass a catheter from the penis upward. If the rupture is proximal to the triangular ligament, one may be satisfied with a perineal incision with drainage for extravasation and an indwelling catheter in the bladder through a suprapubic incision leaving repair of the urethra to later care. This may be accomplished either by sounds or plastic surgery, or a catheter may be passed from the bladder down to the point of rupture and out of a perineal incision, where it can be fastened to a catheter passed up to this point from the distal end of the urethra and drawn out through entire length of urethra.

Extraperitoneal rupture of bladder or rupture of urethra proximal to triangular ligament may require incision in soft parts for drainage of extravasation of urine. Intrapерitoneal rupture of bladder or bowel should be dealt with promptly by laparotomy with suture and drainage.

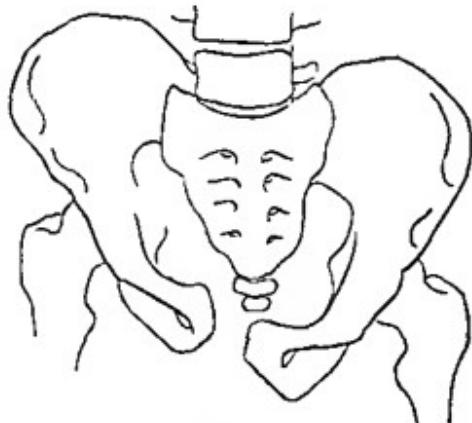
Hemorrhage is often associated with damage to the viscera and is controlled in the repair of these organs. Other bleeding into the soft tissues is usually limited to formation of hematoma, which it is best to permit to be absorbed unless secondarily infected, then drainage is indicated.

The management of the fracture itself again will be governed by the complications present. In the uncomplicated case without correctable displacements, immobilization in a cast is all that is required. Where much drainage, either from secondary infection or urinary fistulae, is present, a frame the size of the mattress with cross bands of canvas, 4 inches wide, facilitates the handling of the patient for toilet and treatment purposes.

Where deforming displacements have occurred and the condition of the soft tissues will permit attempt should be made at reduction. In separation of the symphysis with only lateral displacement a wide belt tightly buckled around the pelvis between the trochanter and crest of ilium may be sufficient. When

displacement is great, open reduction may be necessary to prevent permanent disability.

Case I is that of a young man twenty-eight years of age who fell a distance of 10 or 12 feet, landing on one tuber ischium on a steel rail. The impact drove the innominate bone upward and



CASE I

Fig. 354



CASE I

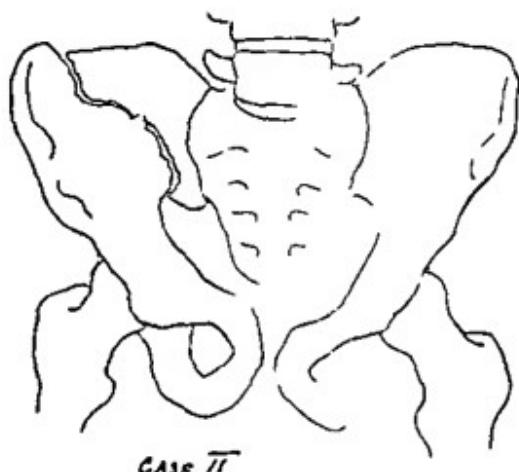
Fig. 355

backward, producing wide separation of the symphysis. There were no visceral complications. Traction with 20 pounds weight for twenty-five days failed of satisfactory reduction, so under general anesthesia on the traction table the bone was pulled into place and the symphysis wired. After removal of the car-

tilage, chips of bone were packed in between the bone edges. The sacro iliac joint was opened, the cartilage removed, and the ilium pegged to the sacrum. The joint space was filled with bone chips cut from the ilium. The patient was immobilized in a cast for three months, at the end of which time both joints were fused. At the end of two years the patient was again doing his full duties without any shortening or other disability. This is the only case we have had of disarticulation of two joints of the pelvis *without fracture*.

Case II represents a condition similar to Case I except in this instance there was a fracture through the wing of the ilium, near the sacro iliac joint, with displacement upward and outward of the innominate bone. It is the case of a young brakeman, twenty years of age, who, while making a coupling between freight cars, was backed into by a train on parallel track, and thrown violently to the ground and dragged. He stated that he thought he was hit in the buttocks by the journal of the passing freight car. Ten days of weight traction failed to bring the fragment into satisfactory position and an open reduction was done treating the symphysis as in Case I. Fusion of the symphysis and healing of the fracture followed and full return of all function, without shortening or other disability.

Case III is that of a man thirty eight years of age, who was thrown from a "speeder car," landing in such a way that he was rolled heels over head and rendered unconscious. The minute details of how he was struck he could not give, but he was helpless to get up. His body was much bruised and considerable swelling and discoloration occurred about the right side of the pelvis. For two weeks he was kept in bed and the pelvis strapped together with a heavy belt placed between the trochanter and crest of the ilium. At the end of two weeks he was immobilized in a plaster cast which was kept on for two months. At the end of this time the symphysis was very mobile and pubis and ischium held in malposition by callous at the site of fracture at acetabulum. It was deemed best not to attempt to fracture the



CASE II

Fig 356



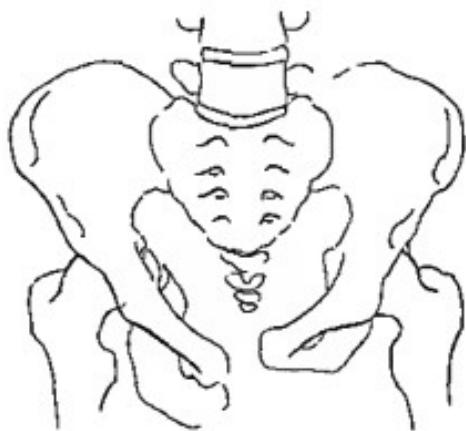
CASE II

Fig 357

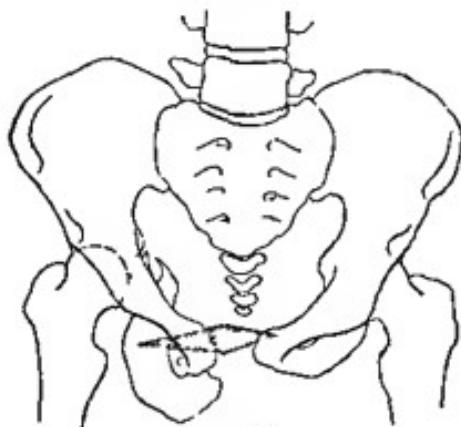


CASE II

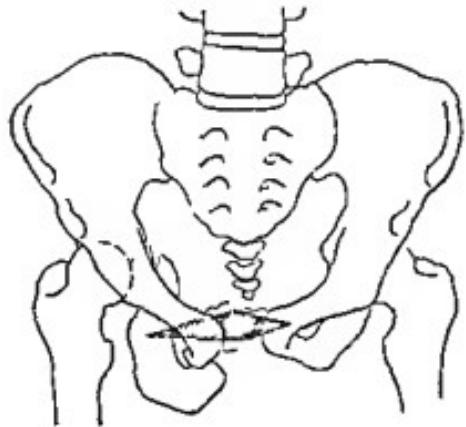
Fig 358



CASE III  
Fig 359



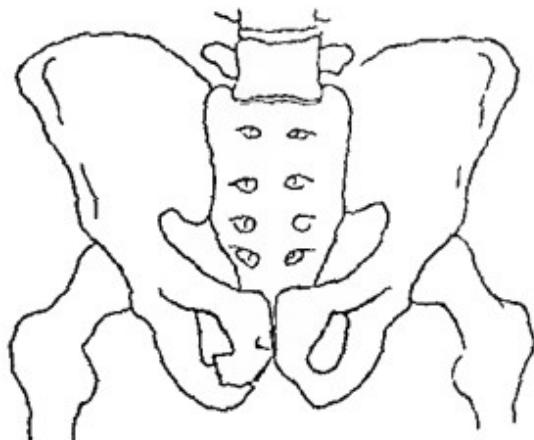
CASE III  
Fig 360



CASE III  
Fig 361

callous to bring pubes together, so an autogenous bone transplant taken from the tibia was inlaid across the gap after removing the cartilage. It is fourteen weeks since this operation was performed and satisfactory callus forming. We expect fusion of the symphysis with full recovery.

Case IV is that of a man thirty six years of age, who while riding a railway motor car, was thrown off in front and the car ran over him. He was brought to the hospital where radiographs showed a fracture of the descending ramus of pubes. There was a contusion near the anterior superior spine of the ileum. It was determined early that the urethra and bladder were patent but



CASE IV

Fig. 362

during the next two hours the patient complained of considerable pain in the abdomen in the lower right quadrant. The accident happened at 8:30 o'clock in the morning and by 2:30 in the afternoon his temperature had gone up to 100° F and he had also a leukocytosis of 17,000 and signs of rigidity in the right rectus muscle, all pointing toward a localized peritoneal irritation. At 5:30 o'clock the signs were so marked that the abdomen was opened and a small hole, the size of a pea, was found punctured in a loop of the ileum. There was some plastic fibrinous exudate about the traumatized intestine, but the gut was not badly enough damaged to require resection. The laceration was

sutured in transverse direction and a drainage tube was put in the peritoneal cavity down to the infected field. Patient made a very satisfactory recovery.

Case V is that of a laborer who while crossing a street was struck by an automobile. He was thrown violently to the pavement and ridden over by the car. The accident happened at 5:20 o'clock in the evening and the patient was brought to the hospital within one half hour in great shock. Radiographs

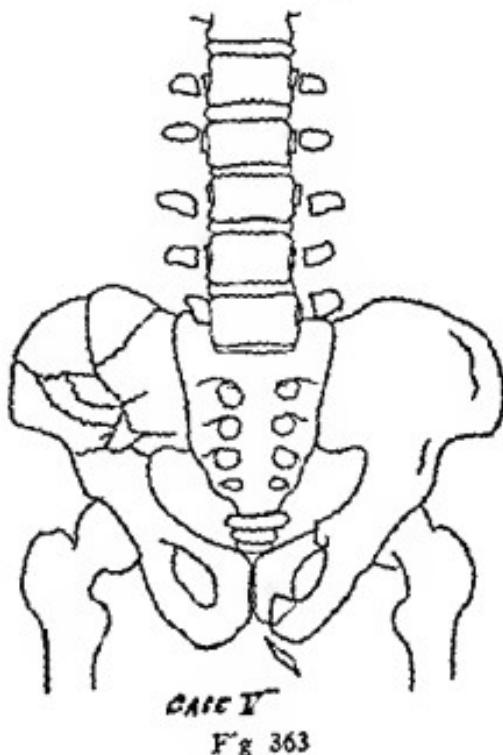


Fig 363

showed a stellate fracture of the right ileum and simple fracture of the left pubic ramus with fracture of the transverse processes of all the lumbar vertebræ. In this case the trauma and shock were so severe that death occurred seventeen hours after the accident. The patient did not recover from the shock.

Case VI is that of a man fifty years of age who was helping to move a piano from one freight car to another. The piano tipped over and pinned him down squeezing his abdomen. He

was taken to the hospital in Minneapolis, where a diagnosis of a fracture of the pubic ramus was made and he was placed on a fracture bed. Great urinary extravasation occurred all through the perineum and groins which necessitated many incisions. These incisions through the skin discharged urine which finally became urinary fistulae. Six months after his accident with the pelvic bones healed, he came into our hands for treatment of the fistulae. Our examination showed complete severance of the urethra proximal to the triangular ligament with scar completely obstructing the urethra. Through a suprapubic opening catheters and sounds were passed down to the obstruction and an

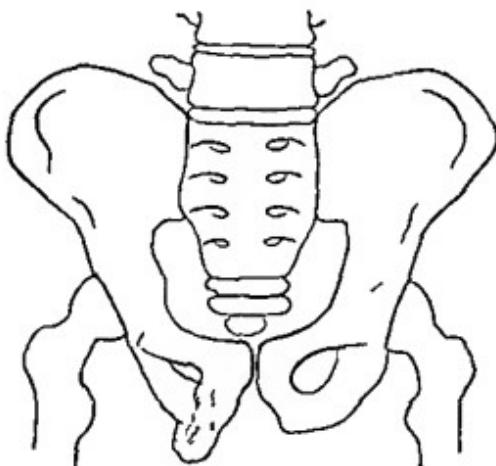


Fig 364 Case VI.

opening in the perineum made at the point of obstruction. The scar was dissected out and the stumps of the urethra brought together over an indwelling catheter. The patient was in the hospital from March 20th to May 5th and left in excellent condition, being able to admit a 22 French sound through the healed stricture site. The sinuses healed spontaneously after the urethra became patent. The patient returned to duty as a flagman, and was required to have sounds passed at intervals of every four to six weeks. It is my recollection some two or three years after his return to duty he committed suicide.

Case VII is that of a man who was riding in a taxi which skidded sidewise, throwing him against side of the seat, with the

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## CLINIC OF DR J P GREENHILL

### CHICAGO LYING IN HOSPITAL

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#### ABRUPTIO PLACENTÆ AND UTEROPLACENTAL APOPLEXY

THE occurrence of premature separation of the normally implanted placenta, variously known as abruptio placentæ (De Lee), ablatio placentæ (Holmes), and accidental hemorrhage (Rigby), is much more common than most physicians realize. Most individuals associate abruptio placentæ with a tragic condition which frequently ends fatally for mother and child. These are usually instances of complete separation of the placenta associated with shock. However, there are many cases of partial abruptio which are so mild that they have little effect on the mother, but they frequently cause the death of the fetus. When we include the latter cases in our statistics we find that abruptio placentæ is at least as common as placenta prævia. For example, at The Chicago Lying in Hospital, in a period of seven years, among 24,451 obstetric patients there were 70 cases of placenta prævia, but there were 82 cases of abruptio placentæ. Only 1 of the 70 patients with placenta prævia died (1.3 per cent), while 3 of the 82 women with abruptio died (3.6 per cent).

**Etiology**—The cause of abruptio placentæ is still a disputed matter. The usual causes given are toxemia of pregnancy, traumatism, torsion of the uterus, short umbilical cord, diseases of the endometrium, and sudden emptying of a large uterus. Toxemia and injury are associated with most of the cases.

**Pathology**—The pathologic changes of abruptio are described in all text books on obstetrics and need not be repeated now. Suffice it to say that the hemorrhage nearly always begins in the decidua basalis which splits into two parts, one of which remains in contact with the maternal surface of the placenta and

the other retains its attachment to the uterine musculature. There may be complete or partial separation of the placenta and the bleeding may be entirely retained in the uterine cavity or part of it may escape externally. The former is known as concealed hemorrhage and is rare but is very serious. The latter or external form of hemorrhage is more common, but less dangerous. Usually in the cases of concealed hemorrhage external bleeding occurs if treatment is not instituted, although a patient may die from an intra uterine hemorrhage without any external bleeding at all.

Uteroplacental apoplexy is the name given by Couvelaire to a severe form of abruptio placentæ which is associated with changes in the uterine wall and in some cases with changes also in the adjoining structures. The uterus which shows utero-placental apoplexy has a purplish blue metallic color. Histologically one finds small intramuscular hemorrhages about the periphery of the small veins in the uterine wall. These hemorrhages are more marked in the outer portion of the uterine wall, and hence militate against the theory that the blood originated in the cavity of the uterus and was forced into the uterine musculature because of increased intra uterine pressure. The hemorrhage which initiates the separation of the placenta usually begins in the decidua but may begin in the depth of the placenta. Hemorrhages are often not limited to the uterus, but may be found in the broad ligaments, the tubes and the ovaries.

The diagnosis of uteroplacental apoplexy can only be made at operation or at autopsy. When found at operation hysterectomy is nearly always necessitated because the uterus usually fails to contract after its contents are removed.

Symptomatology.—The symptoms of abruptio placentæ need not be detailed here but the following table (from DeLee), which shows the differential diagnosis between abruptio placentæ and placenta prævia, is useful:

<i>Abruptio Placentæ</i>	<i>Placenta Praevia</i>
<i>Symptoms</i>	
1 Sudden stormy onset	1 Rather quiet onset
2 Pain, generally referred to the placental site	2 No pain unless uterine contractions
3 Hemorrhage internally and externally later	3 Hemorrhage always external at start
4 Hemorrhage usually severe—internal or external	4 First hemorrhage generally mild and always external
5 Usually only one hemorrhage	5 Several or history of several
6 May find a cause— <i>injury jar etc</i>	6 Usually no cause
7 Symptoms of a severer hemorrhage than the amount of blood externally shows	7 Symptoms proportional to the amount of blood lost externally
8 Cessation of fetal movements	8 No change usually
9 Hemorrhage continues after rupture of the membranes	9 Hemorrhage usually ceases in all but the central variety
10 Hemorrhage continuous sometimes ceasing during uterine contractions	10 Hemorrhage is usually increased by the uterine contractions
11 Symptoms of toxemia usually	11 Seldom

*Signs*

1 Abdomen distended tense and painful to touch	1 Abdomen as usual for time of pregnancy
2 Uterus tense board like cannot feel fetus (soft in rare exceptions)	2 Uterus soft unless there is a uterine contraction
3 Fetal heart tones absent	3 Almost always present
4 Vaginally no placenta in reach of fingers	4 Placenta palpable in isthmus uteri
5 Bag of waters tense—feel head easily	5 Bag of waters loose—usually head not engaged

Another condition sometimes hard to tell from severe forms of abruptio placentæ is *rupture of the uterus* and the following table indicates the differences

<i>Abruptio Placentæ</i>	<i>Rupture of the Uterus</i>
1 Usually during pregnancy	1 Usually during labor unless due to external injury
2 Uterus enlarged tense and symmetric	2 Uterus small and on one side Fetus nearby
3 Uterine contractions present	3 Uterine contractions absent
4 Feel presenting part of fetus on vaginal examination	4 No presenting part Uterus contracted and empty
5 No tear palpable	5 May feel rent or even intestines

**Prognosis** —The prognosis in the cases of complete abruptio placenta and in the cases of uteroplacental apoplexy is very bad. Many mothers and practically all the babies die. In the cases of partial detachment and of external hemorrhage the maternal mortality is usually but not always dependent upon the amount of blood lost but many babies are lost in these forms also.

**Treatment** —The treatment of abruptio varies with many factors such as the general condition of the patient, the state of the cervix the surroundings and the skill of the attending physician. In the mild cases which frequently occur in the second stage (hence the cervix is fully effaced and dilated) immediate delivery of the baby by forceps or version and extraction is indicated. For the mild cases in which the cervix is not completely dilated rupture of the bag of waters may suffice. A colpeurynter may then be inserted to hasten dilatation of the cervix.

In the severe cases an effort must be made to check the hemorrhage and this usually can only be accomplished by emptying the uterus. The method chosen to empty the uterus depends upon the amount of blood already lost the general condition of the patient and the state of the cervix. That method is chosen which will empty the uterus quickest and with the least harm to the mother. The baby is not given much consideration because nearly all of them (in the serious cases) die in utero before the physician arrives.

If the cervix is partially dilated, and there is not excessive bleeding one may rupture the bag of waters pack the vagina and apply a tight abdominal binder to make counterpressure. Ergot and pituitrin may be given to hasten labor. A more rapid method is the insertion of a bag or very careful manual dilatation of the cervix followed by forceps delivery or version and extraction. If the child is dead craniotomy should be performed.

If the cervix is undilated and internal hemorrhage is going on the uterus should be emptied either by vaginal or abdominal cesarean section preferably the latter. If at operation the uterus shows the picture of uteroplacental apoplexy and does not con-

tract after removal of the fetus and placenta even after the use of pituitrin and ergot it should be removed

After removal of the fetus placenta and blood the uterus (if not removed) should be packed tightly if there is any undue bleeding. Then efforts should be directed to combatting the anemia which is present in nearly all the severe cases. These efforts should begin as soon as the patient is seen, even before delivery, and consist of hypodermoclysis of saline solution, blood transfusion where necessary stimulants heat etc. It is advisable to give these patients ergot by mouth during the first week postpartum.

I have selected the following 3 cases because they are interesting examples of abruptio placentæ and because they represent three different types of etiology. One is a case of utero-placental apoplexy,

Case I—Mrs B G age forty a para XI who had previously had eight full term spontaneous deliveries and two miscarriages was being cared for at home by one of the interns of the Dispensary Service of The Chicago Lying in Hospital. A diagnosis of twins had been made and the first baby was delivered spontaneously without any trouble. The heart tones of the second baby remained regular and after an interval of twenty minutes the second bag of waters was ruptured artificially in the hope that the second baby would be expelled. The uterus at this time extended 6 cm above the umbilicus. The vaginal examination at the time the membranes were ruptured revealed that a shoulder and arm presented in the pelvic inlet. The diagnosis was Sc R P. When this was recognized I was called by telephone and I arrived at the patient's home about twenty five minutes after the bag of waters was ruptured. At the time of my arrival the patient was almost lifeless. She was extremely pale, her pulse was 122 per minute very thready, and irregular. There was an anxious expression on her face and air hunger was present. The skin was clammy. The uterus, which was very tense and tender, extended up to the xiphoid and seemed large enough to contain a full term twin pregnancy. Fetal heart

tones were absent and there was a slight amount of bleeding from the vagina. The diagnosis of premature separation of the placenta was obvious. The intern said that when he ruptured the membranes there was a sudden gush of an unusually large amount of liquor amnii. A few minutes after the rupture of the membranes he noticed that the patient was becoming paler and she complained of weakness. Soon after this he observed that the uterus was larger and harder than it had been before.

One of the students who had accompanied the intern was asked to call the hospital and have a delivery room made ready and also to call for an ambulance. The foot of the patient's bed was elevated and the patient was given morphin and caffein sodium benzoate hypodermically. She also received whisky in hot tea by mouth. I packed the vagina tightly and then applied a tight abdominal binder and made counterpressure by means of a Spanish windlass. The intern was asked to sit with the patient in the ambulance and see that the Spanish windlass compress was maintained and then I left for the hospital.

When the patient arrived all preparations for an immediate delivery were ready. Under very light ether anesthesia (which caused an improvement in the patient's pulse) I performed a version and extraction without any difficulty and delivered a stillborn baby which weighed 3025 grams (6 pounds 11 ounces). The placenta which was entirely free in the uterus was manually removed and with it about 2500 c.c. of clotted and unclotted blood. The patient was then given pituitrin and ergot hypodermically and a hypodermic of pituitrin directly into the uterine muscle through the abdominal wall. After this there was no bleeding from the uterus.

During the delivery the patient received 1000 c.c. of salt solution hypodermically in both axillæ. The blood which was removed from the uterine cavity was mixed with salt solution filtered and then given to the patient per rectum by the drip method. The pulse at the end of the delivery was 106 per minute and of good quality.

The placenta was a very large single placenta of the uniovular type. There were two amnions but only one chorionic

membrane. Both cords were inserted centrally and were of normal length. There were a few minor depressions in the placenta due to the pressure of blood-clots.

Autopsy on the baby showed that death had been due to intra-uterine asphyxia and this, of course, was due to the separation of the placenta.

The patient made an uneventful recovery except for a rise in temperature to 101° F., which occurred on the fourth day. The patient left the hospital well on the thirteenth day after admission.

*Discussion.*—The etiology in this case was most likely the sudden release of a large amount of liquor amnii when the bag of waters was ruptured artificially. At no time during pregnancy had there been any signs or symptoms of toxemia. The blood-pressure just before delivery was 130 mm. systolic and 85 mm. diastolic, and the urine was negative.

Almost all the hemorrhage in this case was concealed inside the uterus, for the amount of external bleeding was very slight and consisted essentially of serum (from the blood-clots in the uterus). This is unusual because the inlet was not completely blocked by the fetal head or breech. The presenting part was a shoulder.

Delivery was accomplished by version and extraction because the cervix was completely effaced and dilated and because there was a shoulder presentation. Delivery was not attempted at home because of the unusually poor surroundings and filth. The patient was given back by rectum the blood she lost from the uterus. However, the only part of the blood which was absorbed was the serum, because most of the blood-cells were later expelled with the feces.

**Case II.**—Mrs. J. K., a primipara, aged twenty-eight, was under the care of Dr. Serbin, who saw the patient during pregnancy regularly every three weeks. The expected date of confinement was May 7, 1925. Everything was normal until March 23d, when a small amount of albumin and a few casts were found in the urine. The blood-pressure was only 126 mm. systolic and

84 mm diastolic but the patient was placed on a low protein diet Three days later the blood pressure was exactly what it had been before but the urine contained 3+ albumin and many hyaline and granular casts The eyelids were slightly puffy but there were no other outward signs or symptoms The patient was advised to remain in bed at home and to eliminate all proteins from the diet A daily specimen of urine was sent to her physician and he visited the patient at home for blood pressure readings

The blood pressure gradually rose until April 2d (seven days later) when it was 166 mm systolic and 86 mm diastolic The urine contained 4+ albumin and many casts and there was generalized edema most pronounced in the feet hands face and abdominal wall The patient was admitted to The Chicago Lying in Hospital on the same day and given castor oil and quinin to induce labor Weak pains began the following morning but the patient began to vomit and had a convulsion At this time the blood pressure was 178 mm systolic and 100 mm diastolic She was given morphin and I saw her in consultation after she had a second convulsion On making an abdominal examination I found the uterus very tense and the fetal parts could not be outlined The fetal heart tones were 90 per minute but regular On making a rectal examination to determine the amount of cervical dilatation old blood escaped from the vagina The cervix was undilated On the basis of the board like uterus the inability to outline the fetus the very slow fetal heart tones and the passage of old blood per vaginam a diagnosis of abruptio placenta was made and because of this and the eclampsia I quickly performed a low or cervical cesarean section The bag of waters was intact at the time of operation and the fetal heart tones were somewhat irregular Before the operation the bladder was catheterized and almost pure blood was obtained instead of urine On opening the peritoneal cavity much bloody serum was found there also When the incision was made in the lower uterine segment about 250 c.c. of old blood clots appeared in the incision The baby which presented by the breech, was delivered without difficulty and was alive

The placenta which was partially detached was removed manually and the uterus was packed. The placenta showed that a little more than one quarter of it had separated from the uterine wall and this portion was flattened presumably the result of pressure by blood clots. After the operation the patient had nine more convulsions. Large doses of morphin and luminal were given hypodermically and chloral glucose and sodium bicarbonate by rectum. Only  $3\frac{1}{2}$  ounces of urine were passed in the first forty eight hours during which the urine contained a small amount of blood. Soon after this the patient took fluids by mouth and there was polyuria and much perspiration and the edema rapidly disappeared. The convalescence was marred by three abscesses in the thighs where the injections of luminal had been given. The abdominal wound healed per primum and the baby thrived very well. On the thirteenth day after operation the blood pressure was 128 mm systolic and 75 mm diastolic and the urine contained only a trace of albumin. On April 21st (the eighteenth day) the blood pressure was 120 mm systolic and 68 mm diastolic and the urine contained a trace of albumin. On this day both mother and baby left the hospital in good condition. When the patient returned eight weeks later her blood pressure was 120 mm systolic and 86 mm diastolic and the urine was entirely negative.

*Discussion*.—In this case the abruptio of the placenta was associated with an acute and severe toxemia namely eclampsia. The latter developed rapidly in spite of good prenatal care. The separation of the placenta was partial and was first noticed after the patient had had two convulsions. In this case there was blood not only in the uterine cavity but also in the urine and in the peritoneal cavity.

Eclampsia alone is very grave and so is abruptio placentæ but the combination is extremely serious. The only chance of delivering a live baby was by cesarean section and we had to hurry because the heart tones were very slow and somewhat irregular before the operation.

Convalescence was disturbed by three abscesses due to hypodermics of luminal and I should like to caution against giving

luminal hypodermically because others have had the same misfortune. The patient recovered completely from the eclampsia and is now perfectly well.

**Case III**—Mrs S. L., aged thirty three a para IX, who had had six spontaneous and two forceps deliveries was admitted to The Chicago Lying in Hospital January 26, 1926 in a moribund condition. While in a taxicab on her way to the hospital because of labor pains she met with an accident. The taxicab which carried the patient and her husband collided with another very forcibly. The patient was thrown back on the seat and fainted. The husband noticed that the patient was very pale after this.

On admission the patient who was very fat (she weighed 230 pounds before pregnancy) was extremely pale. The mucous membranes of the conjunctivæ and gums as well as the skin were almost white. The patient kept moaning "I am dying" and really appeared so. She was very restless and complained bitterly of strong abdominal pain which was constant. The pulse rate was 104 per minute and the blood pressure was 100 mm systolic and 70 mm diastolic. The abdomen was enormously distended the uterus extended up to the xiphoid and was very tense. The fetus could not be outlined and no fetal heart tones could be heard. The patient said she had felt the baby before the auto accident but not since. No intermittent uterine contractions were felt. There was no external bleeding but when on rectal examination I pushed the fetal head up out of the pelvic inlet a moderate amount of old serum escaped from the vagina. The cervix was thick and dilated 2 cm. A diagnosis of abruptio placenta or partial rupture of the uterus was made and immediate laparotomy decided upon. Morphin and digalin were given hypodermically and a liter of saline solution was given subcutaneously. The patient's blood was matched for blood transfusion.

Laparotomy was performed under local (novocain) anesthesia. On opening the peritoneal cavity a moderate amount of blood stained serum was seen. The uterus presented the picture of

uteroplacental apoplexy and there was a moderate sized hematoma in the left broad ligament. The uterus was opened in the lower uterine segment and lower part of the fundus, and a very large amount of dark blood and blood-clots escaped from the uterine wound. The placenta, which was entirely free in the uterus, also presented itself in the wound. The dead baby was delivered by version and extraction, but this was very difficult because the baby had rigor mortis. After removing all the blood-clots, the uterus remained flabby. Because of this the fundus of the uterus was removed together with the left tube and ovary. The latter were removed because of the large hematoma in the left broad ligament. The uterus had been so markedly rotated to the right side that the uterine incision was near the left broad ligament. The operation was prolonged because of bleeding in the left broad ligament high up near the pelvic wall. After the operation the patient was given 2 quarts of saline solution subcutaneously. The pulse at the end of the laparotomy was 90 per minute. The next day the patient's temperature rose to 101.6° F. and the pulse was 120 per minute. The medical consultant who was called in made a diagnosis of lobar pneumonia of the lower lobe of the left lung, toxic myocarditis, and secondary anemia. The red blood-cell count was 2,210,000; the hemoglobin was 45 per cent., and the white blood-cell count was 13,000. The urine was negative. Because of the pulmonary and cardiac conditions a blood transfusion which had been planned was not given.

The abdominal wound healed per primam, but convalescence was delayed because of the respiratory condition. The patient left the hospital twenty-one days after admission.

*Discussion.*—This case is very interesting for a number of reasons, the chief of which is the relationship between the automobile accident and the uteroplacental apoplexy. Most individuals would unhesitatingly say that the trauma caused the pathologic condition in this case because one followed the other so quickly. However, a few obstetricians deny the rôle of injury in the causation of abruptio placentæ. These obstetricians would claim that in the present case the separation of the pla-

centa would have occurred without the accident and that the injury was simply an exciting cause. This patient had no signs or symptoms of toxemia hence toxemia cannot be held responsible.

The uterus was markedly dextrorotated but this in all likelihood had nothing to do with the abruption of the placenta. Experimentally however Morse was able to produce hemorrhagic lesions in the uterus by means of excessive rotation which interfered with the circulation of the blood.

The rigor mortis of the baby is interesting because of its comparative rarity and because it might have caused trouble if delivery had been attempted *per vaginam*.

The question of treatment is important. Was I justified first in performing a laparotomy and second in removing the uterus? A laparotomy was performed because the patient was in critical condition because of bleeding which was going on in the uterus and because the cervix was thick and dilated only 2 cm. Furthermore there was a possibility of a partial rupture of the uterus. If delivery had been attempted from below it would have necessitated a rapid manual dilatation of the cervix (which nearly always tears the cervix) or a vaginal cesarean section followed by version and extraction or by craniotomy. Version and extraction would most likely not have been attempted because the baby was dead but had such an attempt been made it would have been very difficult because of the rigor mortis. Furthermore for these forms of delivery from below an inhalation anesthesia would have been necessary and this ordinarily adds to the danger of any operation. Whenever possible we avoid an inhalation anesthetic for many reasons among them being a desire to decrease the incidence of postoperative pneumonia. Nevertheless our patient developed pneumonia within a short time after delivery in spite of the fact that the anesthetic throughout the operation had been novocain except for the difficult delivery of the child when a few whiffs of ethylene were given.

Was the hysterectomy justifiable? All are agreed that in cases of uteroplacental apoplexy where in spite of pituitrin ergot and tamponade the uterus remains flabby after the baby

placenta and blood are removed a hysterectomy should be performed. In our patient the uterus showed the condition of uteroplacental apoplexy and it remained flabby after its contents were emptied even after the hypodermics of pituitrin and ergot. Furthermore there was a hematoma in the left broad ligament with the likelihood of a partial rupture of the uterus. The patient had had 8 children, 6 of whom were living at the time of operation hence I did not hesitate to remove the uterus for the reasons just mentioned.

This patient as well as the first one reported had had 8 children before the attack of abruptio placentæ. This information agrees with the fact that multiparas are more susceptible than primiparas to this accident and this susceptibility seems to increase with the number of pregnancies. The vascular changes in a uterus which has borne many children makes that uterus especially vulnerable to uteroplacental apoplexy.

In performing a cesarean section in a case of uteroplacental apoplexy the incision in the uterus should be made in the lower uterine segment because this portion is usually free from the disease. For the same reason when a hysterectomy is necessary, the lower uterine segment should be left.



